Report by the
Ontario Task Force
on the
Human Environment

toward an

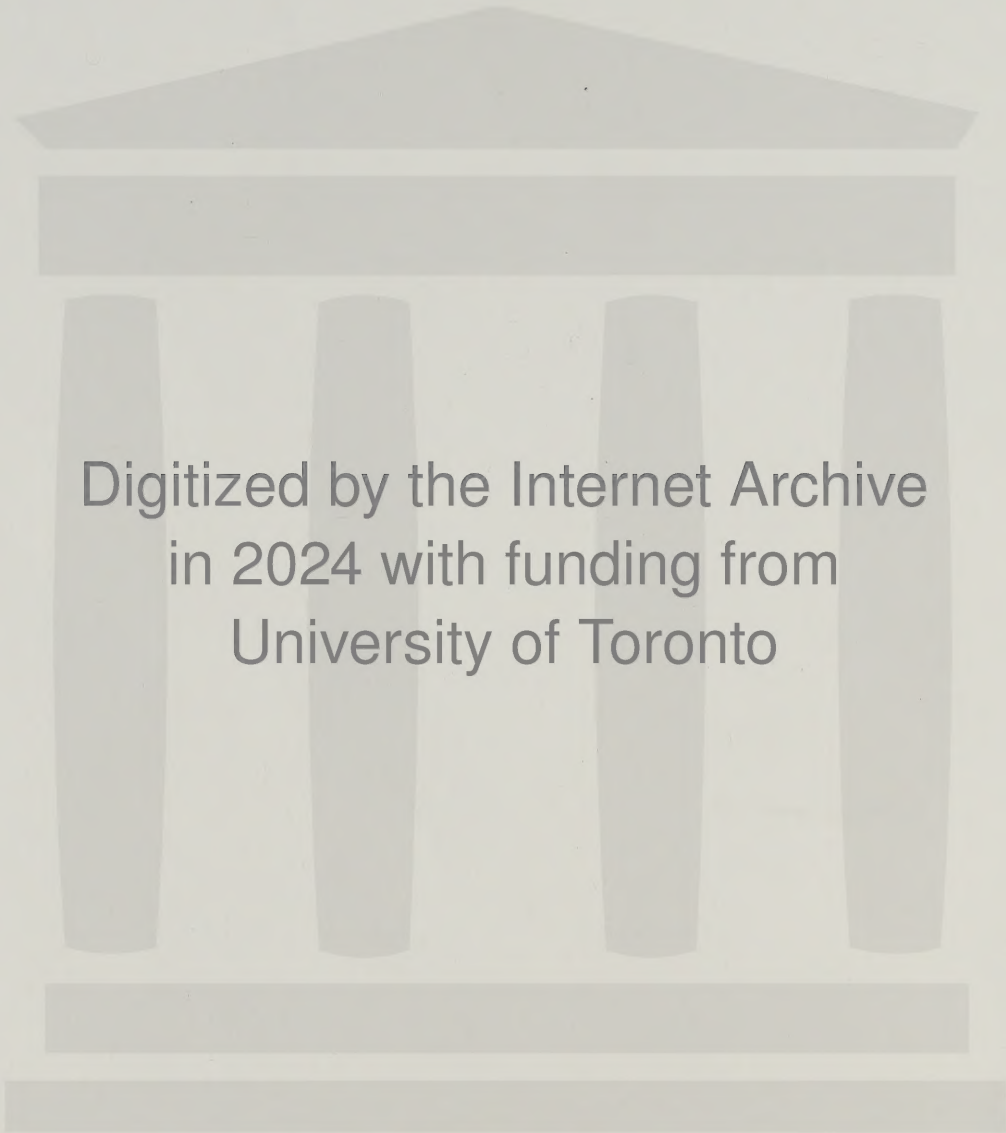
Environmental Action Plan

In response to the
Conference on the
Human Environment,
Stockholm, Sweden,
June 1972

Ontario

for co-ordination by the
Federal-Provincial Committee of
Deputy Ministers of the Environment

June 1974



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PREFACE

The United Nations Conference on the Human Environment held at Stockholm in June 1972, proclaimed a Declaration on the Human Environment, and approved 109 recommendations as an Action Plan to guide the nations of the world in future management of the human environment.

While the Declaration on the Human Environment underpinned the initiatives taken at the Conference, other basic issues debated included the educational, social and cultural aspects of environmental issues; human settlements; development and the environment; natural resources management; pollutants and the establishment of new United Nations machinery to implement international programs.

While environmental problems are worldwide, they can only be solved domestically and locally, provided there is co-ordination and co-operation on regional, national and international levels.

The recommendations for action were directed to the nations at the international, national and regional levels by a formal reference approved by the conference. Canada is now responding to these recommendations.

The Federal - Provincial Task Force, comprised of representatives from each province and the federal government, was established in October 1972 to prepare a framework for action for Canada on the problems of the environment.

The Ontario Task Force was formed by the Province of Ontario and includes, representatives from the following ministries and agencies: Agriculture and Food, Colleges and Universities, Community and Social Services, Consumer and Commercial Relations, Education, Energy, Environment, Health, Housing, Industry and Tourism, Labour, Natural Resources, Revenue, Transportation and Communications, Treasury and Economics and Intergovernmental Affairs; the Ontario Housing Corporation and Ontario Hydro were also represented on the task force. The Task Force Members are named in Appendix IV.

The Ontario Task Force was asked to examine existing policies and programs of Ontario as they relate to the human environment to determine where program gaps may exist in the light of the Stockholm Conference and to make recommendations on policies and programs. In doing so, the Task Force gave consideration to the recommendations presented at the Man and Resources Conference sponsored by the Canadian Council of Resource Ministers which was held in Toronto in November, 1973.

The issues at the Stockholm Conference pertaining to the maintenance of resource viability and the quality of life, the economic impact of environmental considerations, the need for planning, information exchange, education and research, and the field of intergovernmental responsibilities were examined, particularly as they relate to this Province.

Out of this, frameworks for action in each of these areas were developed and have been consolidated into an Environmental Action Plan. The recommendations contained in the Action Plan will be forwarded for consideration of the other Provinces and the Federal Government.

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Environmental Action Plan

Each chapter of this Response to the Recommendations of the United Nations Conference on the Human Environment concludes with a Framework for Action related to the specific areas of interest to Ontario and the role the Province may play in contributing to a better human environment.

While the areas of direct interest to Ontario are clearly indicated, a number of the recommendations have pertinence to the national and international situations, and will be considered in the report of the National Task Force.

The frameworks generally contain elements which apply to the three main action areas identified by the Conference, i.e. Environmental Assessment, Environmental Management and the Measures to Support National and International Actions.

The individual frameworks contained in each chapter have been consolidated in this section as an Environmental Action Plan and are proposed as a guide to the Government of Ontario in its development of environmental and related policies.

The recommendations have been grouped under the following headings:

Development and Environment

Identification and Control of Pollutants, especially those of international significance

Planning and Management of Human Settlements

Maintenance of a Viable Resource Base

Information, Education and Research Aspects of Environmental Issues

Institutional Arrangements and Responsibilities of Governments

Preamble

In recognition of the need for prompt and effective implementation by governments and the international community of measures designed to safeguard and enhance the human environment for the benefit of present and future generations of MAN, and

Recognizing that responsibility for ensuring the protection and enhancement of the human environment rests primarily with Governments, and

Recognizing that environmental protection and enhancement can be exercised more effectively in the first instance at local, regional, provincial and national levels, and

Recognizing that environmental problems of broad international significance fall within the competence of the United Nations system, and

Bearing in mind that international co-operative programs in the environment field must be undertaken with due respect for the sovereign rights of states and in conformity with the Charter of the United Nations and principles of international law, and

Noting that environmental problems for two-thirds of the world's population are of lesser concern than the problems of poverty, malnutrition and illiteracy to them, and recognizing, therefore, that the most urgent task facing mankind today is to solve these immediate and formidable problems, with high priority being given to the development of the countries affected, and

Recognizing that the gap between the poor and the rich countries of the world must be substantially narrowed in order to make significant progress in improving the human environment for the world's populations, and

Recognizing that, in order to secure the adoption and use of environmental technology throughout the world, the developed nations must maintain their economic strength and the flow of assistance to developing countries, such assistance to be augmented to the extent needed to meet the environmental requirements of such countries, and

Conscious that Canada, and the Province of Ontario in particular, is one of the more highly developed economic regions of the world and that it has, therefore, a particular responsibility in this vital area, and

Being aware of the urgency to solve varied problems related to congestion, noise, land shortages, pollution of air, water, food and soil and resource depletion, and

Conscious that many of the environmental problems in urban, rural and other areas of the Province and of Canada and of other parts of the world, as well, arise from concentrations of population and related imbalances in resource and land use and consumption inflated by waste,

THE ONTARIO TASK FORCE ON THE HUMAN ENVIRONMENT recommends, in matters concerning:

A. Development and Environment, that:

problems of concentrations of population and consumption of finite resources

1. all levels of government in Canada be urged to pursue policies of economic and social development which address the human environmental problems both within Canada, and external to Canada, created by concentrations of population and related imbalances of resource and land use and consumption of finite resources.

population growth and distribution, and development assistance

2. the governments in Canada be urged to act in concert to develop a co-ordinated national approach to the problems of rates of growth, population distribution and development assistance in areas both internal and external to Canada.

optimum population size for urban developments

3. through the Design for Development Program, the Government of Ontario—in concert with other levels of government should intensify efforts to determine the optimum size for existing and proposed urbanization, having regard to the environmental, social and economic consequences of implementing the objectives and policies of the ministries of the Government of Ontario in each development region of the Province. Utility policies, notably sewage service among others, which fuel the population growth process in heavily developed urban areas, should be re-examined and made consistent with future objectives for population and development.

development goals

4. in formulating strategies for development, the Province should set goals and targets which encourage degrees of economic growth and social development compatible with the maintenance or achievement of objectives for environmental quality.

   Consideration should be given to the progressive reduction of housing shortages, the provision of adequate utilities, including water supply and waste disposal facilities, and the provision and maintenance of open space, park and recreation areas for public use. In terms of human progress, increasing encouragement should be given to opportunities for personal growth, physical and mental well-being as well as improved social and esthetic conditions.

benefits and costs of development projects

5. the governments should, in due course, adopt the practice of requiring that proposals for resource use and development, including product development, incorporate a demonstration of the proposal's contribution to planning objectives, indicating expected benefits and costs in terms of environmental, economic and social factors. Consideration of such matters as comfort, convenience, the well-being of people and the ability of business, industry and transportation systems to oper-

ate efficiently should not be viewed in isolation from resource depletion or pollution of air, water and soil. By identifying and correcting problems in the conceptual stage of a project, the need for subsequent corrective measures, i.e. pollution abatement or restorative efforts and related social costs could be held to a minimum.

periodic reports on the state of the environment

6. as part of a national program, the Province should conduct periodical studies to determine the state of the environment and anticipate any environmental problems likely to arise. Special attention should be given to the resolution of conflicts or possible conflicts between public and private interests in the use of the environment, precipitated by specially advantageous resources. The institutional and planning methods for the resolution of such conflicts should be reviewed, and serious conflicts reported to the Legislature.

effects on interprovincial commerce, international trade, and remedial action

7. the Province should examine environmental policies and programs in terms of their impact on present and future development throughout the Province and elsewhere in Canada.

   In particular,

   (a) efforts should be made to reach interprovincial or national consensus on evidence of discriminatory commercial or trade policies between provinces,

   (b) the Province and all other provincial governments, in co-operation with the Federal Government, should identify factors adverse to interprovincial commerce, particularly those of less industrialized provinces that arise from more restrictive environmental regulations elsewhere in Canada.

   (c) in Canada's trade with other countries, the Province should support and encourage efforts by the Government of Canada, in co-operation with the countries involved, and where appropriate, the United Nations, to identify threats to trade arising from environmental concerns and to develop acceptable common international standards.

   Where environmental concerns in Ontario lead to restrictions of commerce or trade between provinces, the Province, where it is in a position to do so, and where appropriate, the Government of Canada, should provide the needed technical or other assistance to less-developed parts of the Province and country in order that those responsible can adequately carry out their environmental obligations. The Government of Canada, and where appropriate the Provinces, should be urged to provide similar technical or other assistance to other countries as required.

on-going review of impacts adverse to international and interprovincial trade and commerce

8. the governments in Canada should seek the establishment of an institutional framework within Canada capable of examining adverse trade implications of environmental policies at the international and interpro-

vincial market levels. This would recognize the economic interdependence between the various provinces, as between nations, and the fundamental importance of economic stability to the strengthening of environmental management programs. Eventually, this institutional concept could be expanded to examine the more general economic impact of environmental policies, including the effects on income distribution, employment, the possible negative aspects of existing taxation as well as the costs of benefits from tax relief.

environmental comparative advantage

9. the Province should undertake a study of environmental comparative advantage throughout Ontario with a view to the future establishment of industry. In formulating industrial development strategies in Ontario and elsewhere in Canada, the governments should fully review the environmental considerations intrinsic with industrial development, and ways in which the developing parts of Canada can be assisted to have the benefits of development with the minimum of environmental risks and costs. This will be an important factor for trade in energy and basic industrial commodities, where frequently the environmental risks and costs of initial processing and conversion are high.

environmental costs

10. the Province should develop an assessment system to evaluate the environmental costs of conducting industrial activities such as energy production, mineral extraction, agricultural production, manufacturing, and transportation. In addition to the direct costs of pollution control, the costs of opportunities foregone because of environmental considerations should be reckoned in the total cost.

environmental assessment of development

11. the Province, should proceed with the early implementation of its Environmental Assessment program. The environmental consequences of public and private developments and their alternatives should be evaluated to choose the preferred environmental future. Provision should be made for the post-development review of projects to ensure the protection of air, water and soil is adequate. The audit should include all environmentally-induced diseases.

strategies for environmental planning and pollution control

12. regional planning strategies and development patterns outlined in official plans and zoning by-laws should encourage construction programs consistent with environmental and social objectives, and incorporate provision for control of air and water quality, soil pollution and noise.

water conservation and waste reduction

13. municipal water and sewage rate structures with increased charges for greater consumption or waste production should be considered. Such would encourage conservation where water supply or water quality may be particularly critical.

improved accountability procedures

14. the Province should be prepared to adapt its regulations and requirements, wherever it may be possible, to improve the accountability of those responsible for pollution of air, water and soil. For example, the Province should consider the development and implementation of regulations which relate the use of waters to water quality objectives, standards, and requirements for effluents discharged to water courses.

recycling of wastes in agriculture

15. increased effort and emphasis should be given to the recycling of agricultural wastes and the utilization of combinations of animal and municipal solid wastes.

"polluter must pay"

16. the principle of the "polluter must pay" should be recognized in the form of citizen payment for increased costs of utilities, services or products. Further, cost increases will be greater where an accelerated cleanup program is in the public interest.

THE ONTARIO TASK FORCE ON THE HUMAN ENVIRONMENT recommends further in matters relating to:

B. Identification and Control of Pollutants, that:

ambient criteria, objectives and standards

17. the Province should refine, extend and continue to co-ordinate with neighbouring jurisdictions the development of criteria for air and water quality. The capacity of the environment should be evaluated for effluents and emissions from human activities, including noise. These criteria, objectives or standards should be used in the development of control programs and other measures for maintaining and improving the quality of the environment.

national objectives for air and water

18. the provincial governments, in co-operation with the federal government, should seek to establish national ambient quality objectives for air and water, based upon nationally-agreed criteria.

monitoring of air and water quality

19. the Province should strengthen its programs for monitoring ambient air and water quality (including precipitation), as well as soils and food, and be prepared to participate in the global Earthwatch program of the United Nations.

monitoring and surveillance

20. the Province should strengthen its programs of monitoring and surveillance of effluents and emissions, including their impacts on ambient quality, to determine compliance with effluent and emission standards and ambient quality objectives.

intergovernmental co-ordination

21. the Province should seek to further co-ordinate its ambient monitoring programs with the Federal Government. A lack of co-ordination could result in diminishing the value of these programs and baseline reference stations. The governments should agree to

joint programs of monitoring air and water quality in areas of mutual interest. Co-ordination would ensure that environmental data are consistent and comparable between the provinces.

development of international standards

22. the Federal Government should be encouraged to take advantage of provincial and municipal expertise in the development of standards for the protection of air, water, food and workers exposed to environmental hazards. There is need to incorporate results of toxicological as well as epidemiological studies on human health effects.

Codex Alimentarius Commission

23. consideration should be given to expanding the work of the Codex Alimentarius Commission in the development of international standards for pollutants in foods.

exchange of information on food contamination

24. among the agencies of the various levels of government and at the international level, a concentrated effort should be made to promote the free exchange of information on programs of research and monitoring of food contamination.

biological monitoring

25. the Province should provide facilities and make them available for the biological monitoring of people, particularly those in situations where there are special risks from exposure to environmental agents.

exchange of health-related information

26. the exchange of health-related information should be facilitated among all agencies having access to such data.

computerization of monitoring data

27. the Province should accelerate computerization of all environmental monitoring data and facilitate quick access by other agencies concerned with pollution and the environment.

remote sensing interpretation centres

28. the Province should improve its remote sensing centre used in surveys of resources and be prepared to adapt the technology to evaluation of pollutants.

reduction of pollution load on watercourses

29. where feasible, the use of land-disposal techniques for municipal sewage treatment plant effluent, particularly on land not being used or not required for food production, should be undertaken to reduce the pollution load on watercourses where water supply is deficient.

reduction of waste

30. the Province should promote the reduction of excessive and wasteful consumption and the manufacture of more durable, recyclable, and repairable consumer products to reduce the volume of "obsolete" wastes. Thereby, the purchasing power of consumers would be protected and costly problems of storage and disposal of wastes reduced. Other advantages would include reduced energy consumption and unnecessary demand for other resources. A penalty tax on wastes, which do not easily lend themselves to re-use or reclamation, should be considered. The government should also consider taxing non-recyclable materials.

penalties for violation of anti-pollution legislation

31. the Province should, in consultation with the other provinces and the Federal Government, consider the denial of government contracts, grants or loans to companies convicted of violating anti-pollution legislation in Canada. Heavy fines or other forms of punishment should be imposed for littering and illegal dumping or discharging of wastes.

selective system of effluent and emission charges

32. consideration should be given to the possible application of further pollution-control incentives to achieve greater compliance with existing pollution-control requirements. The feasibility of a system of selective effluent and emission charges to encourage delinquent waste dischargers to comply with pollution abatement schedules should be considered. To be effective as an incentive, such a system of charges would have to be substantial and yet, at the same time, reasonable.

financial assistance to phase-out environmentally obsolete facilities and needs for employment adjustment

33. the Province, in consultation with other provinces and the Federal Government, should recognize the economic and social dislocations caused by the closing and removal of pollution-intensive activities and products from markets and undertake programs of adjustment to relieve social costs in phasing out environmentally obsolete facilities, and the retraining and relocation of the associated manpower. Assistance might be made conditional on the presentation of firm proposals which would encourage new industrial opportunities and economic advantages, including more jobs.

    The governments should examine existing programs for financing accelerated environmental cleanup action in Canada and determine the impact of this financing on the flow of assistance to other provinces and to developing countries.

pollution damage insurance

34. encouragement should be given to underwriters to develop insurance against pollution damage as an incentive for the improvement of the design and operation of pollution-abatement facilities and systems of recycling industrial pollutants.

prevention of spills

35. in its environmental-control programs, the Province should place greater emphasis upon prevention of spills and losses of oil and other hazardous pollutants, notwithstanding the development of contingency plans which provide response to spill incidents.

measures for the prevention of spills or losses of hazardous materials during manufacture, storage, or transportation

36. to encourage improved capability for prevention of spills or accidents involving hazardous materials, the Province should, where required, amend legislation and adopt:

    (a) regulations establishing standards of performance for facilities used to manufacture, store, and transport hazardous materials,

(b) routing regulations for transport of hazardous materials by all modes of transportation.

siting criteria for locating manufacturing plants involving hazardous substances

37. in municipal planning of land use where installations are proposed for the manufacture and storage of hazardous materials, the Province should establish siting criteria for locating the plant and facilities involved.

legislation to control hazardous products and substances

38. in development of legislation for the control of hazardous products and substances, the Government of Canada should be urged to enact guideline legislation to be administered by the Provinces. While expanding research into the pathways and effects of contaminants, Provincial legislation should be enacted as required to protect human health and the environment and to require the cataloguing of hazardous substances released, and expansion of supporting research.

radioactivity and other hazardous substances

39. with reference to the environmental impact of releases of radioactivity and other hazardous substances, the Province should pursue programs and other measures reflecting the following principles:

(a) rates of release of radioactive wastes into the atmospheric and aquatic environment from all sources should be kept to the lowest possible level.

(b) all release levels of radioactivity should be reviewed periodically and revised so that the build-up of longlived radioactivity in the environment will not unwittingly become a legacy for future generations.

(c) contingency plans to protect public health and safety in the event of a catastrophe at a nuclear facility or heavy water production plant (possible loss of hydrogen sulphide) should be developed and periodically reviewed as population patterns change.

regulations for the control of vessel wastes

40. the Government of Canada should promulgate its regulations for the control of vessel waste discharges in keeping with the United Nations recommendations for the control of sources of marine pollution. This is especially pressing in the light of commitments made by Canada in the implementation of the Great Lakes Water Quality Agreement and the recent recommendations of the International Joint Commission. Initially, these regulations should deal with control of vessel sewage and provision of facilities for the safe and sanitary removal of wastes from all vessels. Other requirements, involving the improvement of vessel design, construction and operation, should provide for control of discharges of harmful quantities of oil and hazardous polluting substances, the safe and efficient handling of all shipboard generated wastes and their subsequent disposal, and the surveillance and enforcement of regulations dealing with the abatement and control of pollution from shipping activities.

THE ONTARIO TASK FORCE ON THE HUMAN ENVIRONMENT recommends further, in matters relating to:

C. Planning and Management of Human Settlements, that

reduction of growth pressures on metropolitan areas

41. increasing emphasis should be placed on the humanizing of urban areas and reduction of growth pressures on metropolitan areas by the provision of economic incentives for the location or relocation of industries in designated areas, by assembling and servicing land-banks for reasonable-cost housing, and by decentralizing governmental services.

regional and municipal planning for land use

42. adoption and implementation of the recommendations of the Ontario Economic Council with respect to regional and municipal planning, development control, zoning, urban renewal, subdivision control and plan implementation should be undertaken to hasten the strengthening of municipal programs. The best or preferred use of land should be determined, and resources preserved and conserved. Agricultural lands should not pass to commercial, residential or other non-agricultural uses.

    By planning toward the preferred use of land, each regional or municipal government should provide for the production of housing of a form, type and cost to more closely satisfy the social and human requirements of the population within its jurisdiction. Furthermore, in preparing these plans, the mix of housing types should be adjusted to redress the current imbalance caused by housing production based for too long solely on economic market conditions.

effectiveness of regional government

43. the Province should monitor the effectiveness of regional governments and initiate such adjustments to boundaries and responsibilities as needed to implement municipal programs for the maintenance of environmental quality.

easing of land shortages

44. government land assemblies should be serviced promptly to ease the shortage of serviced land and decrease inflated land values.

municipal funding

45. the relationship between land taxes and municipal services and the funding of capital and development expenditures warrant examination with a view to determining the feasibility of introducing improvements in the taxation system.

rebating of taxes on building materials

46. consideration should be given to continue seeking for feasible methods for rebating tax surcharges on building materials directly employed in the construction of residential dwelling units, providing such a method can be found whereby the cost reduction can be passed on to the home purchaser.

standards for services

47. engineering standards for services listed in subdivision agreements should be consistent and efforts to improve community design should be increased.

self-help programs

48. the Province, in co-operation with the building materials industry, should promote a self-help program in the form of instruction and an advisory service to encourage individuals to participate in the construction of their own dwellings.

recreational space in regions

49. comprehensive planning of outdoor and indoor recreational resources for each of the five regions in Ontario should be prepared so that acquisition, land use control and other strategies can be developed and implemented in the near future.

recreational opportunities

50. the Province should encourage the planning of outdoor and indoor recreation facilities to complement one another so that a full range of recreational opportunities is available to urban and rural residents.

traffic volume relief

51. programs to encourage public acceptance of staggered work hours for the private and public sectors should be continued and extended to reduce peak-hour traffic volumes and transportation investment requirements.

use of railways

52. the Province should examine possible methods of encouraging the use of railways for freight movement by such means as revised freight structures and subsidies, etc.

intermediate capacity transit

53. the introduction of intermediate-capacity rapid transit to selected metropolitan areas should be hastened and development of flexible urban transportation systems further promoted.

THE ONTARIO TASK FORCE ON THE HUMAN ENVIRONMENT recommends further, in matters relating to:

D. Maintenance of a Viable Resource Base for Ontario, that

conservation of resources

54. in view of the finite nature of our resources, the Province should encourage reassessment of present utilization and consumption practices and place new emphasis on the wise use and conservation of resources to obtain the greatest possible benefit for the Canadian people. Renewable resources should be managed in such a way as to increase productivity, while at the same time maintaining diversity.

planning principles and standards

55. in implementing objectives and policies of the government in each region, all ministries should develop planning principles and standards or criteria to achieve social, economic and environmental goals for the region. The principles would provide the framework

for planning while standards would provide for consistency in the measures adopted to obtain the goals.

co-ordinate collection of resource base information

56. the federal and provincial governments should further develop or expand co-ordinated programs for the collection, measurement, analysis, and exchange of data and information on the resource base in order to improve conservation and the management of renewable and non-renewable resources and provide further knowledge of the inter-relationship between these resources. Specifically, the Province should

    (a) initiate the development or expansion of soil and land capability inventories that could be used for all resource and regional development projects.

    (b) carry out complete ecological inventories of lands and waters before any form of resource extraction or utilization is undertaken. The inventory should include the state, quality and limitations of soil and water; existing uses; demand and supply for recreation; waste production and indices of environmental quality. The inventory should form an input to the regional planning and land-use zoning process in implementing the Ontario Planning and Development Act and be integrated with the Ontario property assessment program.

maintenance of food producing land

57. recognizing that competition is increasing for the use of Ontario's limited supply of food-producing land, the Province should ensure that land suitable for food production should remain available for such wherever possible to maintain an adequate food-producing land base.

federal evaluation of energy

58. the Federal Government should undertake a continuing evaluation of available energy sources, new technology and consumption trends across the nation, and elsewhere in the world, to provide a basis for the establishment of policies jointly with the provinces concerning the utilization of energy resources. Research programs should also be initiated into the development of new energy systems and the determination of the best use of existing systems to avoid wastage of energy.

research of alternative energy sources

59. the Province should encourage wise use of available energy sources and further research into alternative energy sources which do not severely impact the environment.

assessment of impact of energy developments

60. the current practice of evaluating all proposed energy projects involving the use of oil, gas, coal, uranium, hydro power or other alternative energy sources and including the production, conversion, transportation, transmission and use of energy should be incorporated into the proposed Environmental Assessment Program.

conservation of energy

61. the Province should continue to actively promote lower energy use and reduction of wastage by encouraging:

(a) research into the underlying supply-demand factors,

(b) improvements in business planning and industrial promotion, and integration of community development, economic and land use planning,

(c) the construction and manufacture of more efficient, less power-consuming products, structures and related facilities, methods of transportation, as well as applications for the utilization of waste heat. Specifically,

(i) available forms of energy should be employed in new or revised applications for which they are best suited,

(ii) better use of air, land and water transportation facilities should be encouraged to reduce unnecessary energy-wasting practices. As well, efforts should be intensified to provide highly efficient public transit systems, as part of a range of alternatives for the movement of urban and inter-city passengers and freight.

(iii) standards (upgraded building codes) and measures to encourage improved insulation and furnace efficiency in residential and commercial buildings should be adopted as soon as possible. Factors to be considered should include building orientation, limits of glass, lower lighting intensities and energy-conserving mechanical systems,

(iv) more efficient industrial and energy-generating systems should be developed for application,

(v) the utilization of garbage in the production of energy and the use of waste heat from electric generation stations should receive consideration in planning the development of energy-generation facilities.

cooling water policy

62. where utilization of waste heat from electric generating stations is not feasible, the Province should adopt a firm policy on cooling water discharges from generation stations requiring:

(a) the employment of adequate cooling facilities in cases where the harmful effects of the discharge of waste heat can be predicted.

(b) the adoption of flexible designs for power generation stations to permit the addition of cooling facilities or other remedial measures where adverse effects could not be clearly predicted at the time of initial design.

natural disasters and improved shoreland and coastal management

63. the Government should strengthen programs and measures to reduce the impact of natural disasters and other physical hazards, while pursuing strategies to encourage wise use, and as much as possible, the preservation of the character, beauty and uniqueness of natural settings such as shorelands. This should be effected through the implementation of land-use policies which discourage development in flood plains and coastal

zones along the Great Lakes coastline or wherever unstable soil conditions exist.

mining and mineral processing

64. the Province should adopt the following policies respecting the environmental impact of mining and mineral-processing activities.

(a) plans for mining and mineral processing should provide for the use of the natural environment and conservation of finite resources and be subject to analysis for environmental impact.

(b) the full range of regional development strategies and related land-use policies should be considered in planning new developments.

(c) operations should be subject to suitable performance standards and systematic audits to keep environmental disturbance and permanent damage to a minimum.

(d) provision should be made for land reclamation, including the financing of such reclamation to be undertaken either as mining progresses or following mining operations.

(e) legislation dealing with stabilization of mine tailings areas by vegetation or other methods should be extended to include abandoned areas as well as treatment of seepage and runoff.

(f) stabilization and maintenance of abandoned tailings areas where the need has been established should be undertaken by the Province to secure in perpetuity their containment and control; treatment of seepage and runoff should be provided by mining companies or by their successors; the use of lake basins for containment of tailings at new mining locations should be discouraged.

(g) industrial goals for the processing of non-renewable resources to manufactured articles should provide for the greatest economic return with the minimal impact on the environment.

farm management practices

65. the Province should ensure that farm management practices, involving food production and processing, and use of fertilizers, animal wastes, pesticides, etc., are conducted in a manner which exerts minimal impact on the environment, while contributing to the viability of farming and other sectors of the agricultural and food industry, as well as to the social and economic well-being of people, including the farming community.

evaluation of extent of erosion resulting from land use practices

66. the Province should undertake an evaluation of the extent of erosion from a variety of land use practices in Ontario and related trends. Where remedial measures are required, the costs of modifying these practices should be determined.

67. in recognition of the multiple uses to which forests are subject and to achieve, at minimum cost to the environment, the greatest benefit for the people of Ontario, the Province should strive to accomplish the following objectives:

(a) identification of those land areas required to meet government objectives for wood production and incorporation of these into land-use plans. Full consideration should be given to unquantified values such as aesthetics, preservation, conservation and environmental protection.

(b) identification and reservation of forest areas that appear to have unique values and characteristics which equal or surpass the value of the wood volumes.

(c) modification, where necessary, of forest harvesting by delineation of protection forests (sentive sites) and those with aesthetic and recreational values. Cuts should be modified to encourage natural regeneration and improve wildlife habitat.

(d) provision of healthy forests and trees for recreational opportunities and to improve the quality of man's environment.

(e) stimulation of utilization of the allowable cut by industrial expansion and improved use of preferred species.

(f) improvement of the competitive position of the forest industry by rationalizing the supply and utilization of raw materials, including utilization of residues.

(g) protection of the forests against fire, insects and disease by the use of modern technology with due regard for environmental safety.

(h) improvement of silvicultural techniques and their application, development of specialized equipment and evaluation of chemical and biological controls for regeneration and an optimum level of tending (culture).

(i) encouragement of the establishment and management of forests on private lands and creation of a public understanding of forestry so there will be an acceptance of forest management practices.

(j) participation, upon request, in assistance to developing nations by providing on-going staff training as well as contributions to international assignments.

(k) an organization should be formed to make aircraft, water bombers, and crop sprayers available for forest fire and pest control on an international basis.

(l) since the availability of land is limited absolutely, and the commitment of land may not be reversible, encouragement should be given to reserving as much land as

possible against future options, particularly in areas where the traditional life-styles of native peoples are threatened by resource development, and where the biological productivity of land is problematical.

resource inventory, research and management

68. in recognition of the importance of fisheries and wildlife to the welfare of the people of Ontario and Canada, the Province should:

(a) identify the Province's needs and establish fisheries and wildlife objectives;

(b) undertake an inventory of fish and wildlife resources, and identify unique ecosystems and fragile areas;

(c) develop research and management programs for fisheries to meet Ontario's needs and provide assistance to developing nations.

selective breeding of species

69. research should be intensified in the selective breeding of fish, wildlife and forest trees, using preferred genetic stocks; the restructuring of natural communities and the use and exploitation of new species should receive increased attention.

co-ordinating institutions

70. as considerable effort has been devoted to the restoration and enhancement of the water quality of the Great Lakes, increased emphasis should be placed on improvement of the management and research of the Great Lakes fisheries, including increased support for the Great Lakes Fisheries Commission, and liaison with the International Joint Commission.

Other institutional mechanisms for the enhancement and co-ordination of research in wildlife and forest management should receive similar emphasis.

improved understanding needed of natural populations

71. the Province should recognize the increasing need for understanding of the genetic strains of migratory wildlife and for co-ordinating management of this resource between jurisdictions. The introduction of exotic species must be very carefully controlled in order to avoid the dilution of locally-adapted gene pools.

genetic pools and gene banks

72. the Province, in co-operation with the other governments in Canada, should intensify its participation in the world-wide activity of collecting gene pools of agricultural materials, livestock, wildlife and undomesticated plants. Through co-operation with other countries, increasing importance must now be placed on gene conservation and the establishment of gene banks, including the maintenance of a broad genetic base characteristic of natural and representative ecosystems. Recognizing that wildlife species may be threatened with extinction by man's developments, the governments in Canada should give renewed attention to the efforts of such organizations as the International Union for Conservation of Nature and Natural Resources.

genetic conservation

73. as a first step in encouraging world-wide genetic conservation of threatened species, a registry or inventory, identifying breeding and experimental projects related to plants, micro-organisms, animals and aquatic organisms, should be co-ordinated by the Secretary-General of the United Nations.

nature reserves

74. the Province should accelerate the establishment of nature reserve systems and historic sites. This will aid in the identification and conservation of unique or representative physical, biological, cultural and historical areas of the Province and preserve sites which otherwise would be lost.

Man and the Biosphere

75. it will be advantageous for the Province to work closely with the Man and the Biosphere Program (MAB) by contributing to the work of the Canadian Committee on national research on environmental and natural resource problems.

THE ONTARIO TASK FORCE ON THE HUMAN ENVIRONMENT recommends further in matters relating to:

E. Information, Education and Research, that:

exchange of information

76. governments in Canada should encourage programs to strengthen the exchange of information in the following areas:

(a) on all matters related to the quality of the environment especially in the areas of planning and management of human settlements and the educational, social and cultural aspects of environmental issues.

(b) as the federal government is in a favourable position to gather information and acquire awareness of developments in environmental matters, it should maintain formal and informal contact with other countries and disseminate information to the provinces and international bodies.

(c) the governments should implement programs to produce a greater exchange of information concerning the natural environment and man's use of it.

(d) before proceeding with major development projects, the governments concerned should make sure the public is enabled to participate in decisions to ensure that the effects of development are beneficial.

(e) the governments should through regulation of hazardous substances control products which may have an adverse effect on the quality of the environment and inform the public of their actions.

(f) as increases in knowledge, including more specific information concerning the environmental effects of

energy technology and its use, are accumulated through environmental monitoring programs, this information should be published to enhance public awareness and encourage exchange with other government and international agencies.

(g) the Government of Canada should determine which institutions at the international level are best suited to undertake the monitoring of world trade trends as these may be influenced by environmental protection technologies and also those which are suited to provide a forum for the exchange of this information and resolution of conflicts in the area. The Government should then be urged to prepare a specific proposal on this matter to the United Nations for consideration.

(h) the Federal Government should attempt to determine the extent to which current patent laws inhibit the free exchange of environmental-protection technologies.

(i) the Province, in consultation with other governments in Canada, should consider the institution of reporting systems to encourage exchange of environmental protection technologies, especially innovations.

education on hygiene

77. the Government of Canada should actively support the developing countries on matters pertaining to education particularly at the elementary level.

educational assistance to developing countries

78. assistance to developing countries in the achievement of higher levels of education should involve sending Canadian teachers and experts to participate in the school systems of developing countries rather than limiting assistance to invitations to students to come to Canada.

environmental subjects in school curricula

79. the Province of Ontario should encourage environmental education by the integration of environmental themes in the total curriculum and by the introduction of specific courses at appropriate levels of school programs. Both approaches can be effective where the teaching staff has adequate knowledge of the relationships between man, energy and nature. The study of population and family planning should be available to students.

development of educational programs in urban development

80. the Province should encourage the development of educational programs leading to better understanding of urban development at the, elementary, secondary and adult levels. At the college level emphasis could be placed on training for the management of human settlements.

training of professionals

81. governments in Canada should encourage greater numbers of professionals be acquainted with basic understanding of ecology and environmental protection to meet the complex social problems of today.

development of jobs in environmental vocations

82. governments in Canada should continue to encourage the development of jobs in both the public and private sectors for graduates, and persons trained in environmental skills.

mass media information

83. mass media systems across Canada should be encouraged to participate in the extra-mural education of citizens with respect to the benefits of a better human environment.

funding of research on environment

84. the governments should increase their funding of research related to the quality of the environment. This would apply to basic research as well as to research carried out for the development of technology.

substitutes for hazardous products

85. active support should be given to research into substitutes for products or goods that have a detrimental effect on the environment.

furthering studies in ecology

86. increased consideration should be given by governments and centres of research to the furthering of studies in related areas of ecology.

planning and management of cities

87. research should be intensified at all levels of government to improve the planning and management of cities with a view to enhancing the quality of life.

research into environmental hazards

88. intensive research is required to evaluate pathways and risks to health of contaminants and environmental hazards. Research is needed to determine the effects of pollutants on the health of people. This is particularly true of long-term exposures to low levels of pollutants which may produce insidious effects in people.

development of monitoring systems

89. extensive research into more sensitive indicators of environmental harm (e.g. PCB's in aquatic life) and the development of associated monitoring systems should be undertaken.

THE ONTARIO TASK FORCE ON THE HUMAN ENVIRONMENT, recommends further in matters relating to:

F. Responsibility of Governments, that:

joint programs

90. the governments should commence to develop, jointly, plans and strategies for improving environmental programs within Canada, together with support for and assistance to international agencies.

monitoring of sufficiency of legislation, policy and program base

91. provision should be made for an on-going assessment of the adequacy of legislation, policies, programs and other measures at all levels of government which may have environmental implications in Ontario and Canada.

improved liaison in policy development

92. the Province should encourage continued co-ordination of policy development and adopt measures

to improve further liaison between ministries and agencies of government including provincial-municipal relationships.

intergovernmental co-operation and accord

93. recognizing that all levels of government in Canada have specific responsibilities in the field of environmental management, *mechanisms should be developed to avoid repetition, and to ensure the development and implementation of sound environmental programs, with a minimum of overlapping responsibilities.* Accords should be reached between the Federal and Provincial Governments whereby the resources of each would be brought together in complementary environmental programs, with each government acting within its own jurisdiction. Through such co-ordinated and co-operative programs, as well as associated cost-sharing and administration, collective environmental goals can be effectively achieved.

INTRODUCTION

MAN'S RESPONSIBILITY FOR THE ENVIRONMENT

Many of man's present environmental problems, particularly in this western hemisphere, stem from his unwillingness to accept himself as a part of nature.

Historically, his attitude towards nature has been one of conflict, rather than co-operation. He has seen his role as one in which he must have dominance over nature; nature must be subdued and moulded into forms which will serve his purposes.

Only recently has western man come to glimpse the fallacy of this belief and to understand the consequences of his acting apart from nature. It is perhaps one of the greatest paradoxes of our time that the very progress achieved by man in the technological and social fields, which was originally intended to improve his standard of living, now poses serious challenges to the well-being of present and future generations.

Man is now becoming aware that all the progress and growth of modern economic life have been accomplished by the plundering of a finite environment and that the earth's resources are in danger of running out under the pressure of this economic growth.

Dramatic increases in population, technological development and industrial expansion have resulted in the balance between man and nature becoming upset. Natural forces are no longer able to keep in order the animal and vegetable resources of the earth. The resources of air and water and productive soil are likewise threatened because nature has not been able to keep control in competition with our increasing technical skills.

It has now become abundantly clear to us that the earth's space and resources are limited and that a crisis of considerable proportions faces us at the present time.

In other lesser developed parts of the world, environmental problems pale beside those of poverty, malnutrition and illiteracy.

We have finally become aware that to meet the ecological crisis we must abandon some of our basic human ideas - the desirability of fertility and of population expansion, the worship of economic growth at all costs, the tendency of our culture to become more industrialized, urbanized and centralized - and develop instead a whole new set of attitudes which will restore harmony between man and the world around him.

In order to narrow the gaps between developed and developing countries, the nations of the world must develop or maintain their economic and social strengths as well as capacities to adopt and use environmental technology.

The colossal growth in population is of particular significance for the quality of man's environment - particularly in light of current estimates, that world populations will double by the end of this century.

For most of the time that man has existed on this earth, his numbers have been relatively small. Damage to the environment remained local and well within the assimilative capacity of his surroundings. But then, human populations began to soar. Coupled with the more rapid growth in population, the trend to increased urbanization began to accelerate, together with expanding economic activity.

Traffic congestion, noise, air and water pollution all tend to increase with increases in the size of our cities. Recreation areas become overtaxed and privacy diminishes. Facilities for solid waste disposal become overburdened and expenditures increase in enlarging these facilities or in finding alternatives for them.

In short, the amenities of life become harder to obtain and considerably more costly.

Furthermore, as world populations grow, there is increasing apprehension concerning the dwindling supply of land and the natural resources needed to satisfy the demand occasioned by more people. In addition, expanding technological systems consume scarce resources at an unsustainable rate and at

the same time pollute the air, land, and waters with their discarded materials and by-products. In this regard, the earth's finite resources include also the finiteness of the biosphere and its limited ability to absorb waste products as well.

All of this suggests the urgency with which these problems must be confronted. Man can no longer press onward in the blind belief that he lives in an infinite indestructible world. A re-evaluation of our objectives must be made now.

On the positive side, there are indications that this re-evaluation is beginning to take place. Public opinion is questioning many of the values, attitudes and institutions on which the past successes of Western industrial society rest.

Individuals, corporations, labour organizations, civic groups and governments are mobilizing to conserve resources, to control pollution, to anticipate and prevent environmental problems, to manage land more wisely and to preserve the wilderness. But the program must be on a world-wide scale.

In addressing this momentous issue in the Stockholm Conference on the Human Environment, the United Nations responded to initiatives by Sweden and Canada in which the determination of 113 nations was clearly expressed.

The Declaration on the Human Environment concluded at the Conference contains twenty-six principles that will serve as guides to lawmakers and governments in the future (Appendix I). One hundred and nine recommendations, some with many parts, constituting an Action Plan for tackling the planet's environmental ills, protecting man and his habitat, and thus enhancing human well-being, were approved at the Conference (Appendix II).

Also, a recommendation for the establishment of new United Nations machinery and an environmental fund to encourage international initiatives was passed. In Appendix III, other resolutions approved at the Conference are printed for reference.

In Principle I, the Conference acknowledged that "man has the fundamental right to freedom, equality and adequate conditions of life in an environment of a quality that permits a life of dignity and well-being", and at the same time, it emphasizes that "man has a solemn responsibility to *protect and improve the environment* for present and future generations."

The Province of Ontario has developed an environmental policy which is in keeping with the two concepts enunciated in this principle. In the chapters which follow, a description is provided of the current programs which are being carried out within the Province as they relate to the Stockholm Recommendations, together with an outline of the policies and programs which should be formulated and implemented in the future in order that "the quality of life and the protection of the environment" may be assured both for present and future generations.

Chapter 1
A VIABLE RESOURCE BASE

Ontario View of Principles

Concern for the protection of the resource base and its potential for the continued satisfaction of the demands of man and his environment is the central theme of the United Nations Declaration, Principles 2-7 inclusive.

- Principle 2 states, "The natural resources of the earth including the air, water, land, flora and fauna and especially representative samples of natural ecosystems must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate."
- Principle 3 states, "The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved."
- Principle 4 states, "Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat which are now gravely imperilled by a combination of adverse factors. Nature conservation including wildlife must therefore receive importance in planning for economic development."
- Principle 5 states, "The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to ensure that benefits from such employment are shared by all mankind."
- Principle 6 states, "The discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems. The just struggle of the peoples of all countries against pollution should be supported."
- Principle 7 states, "States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea."

Summary of U.N. Recommendations

The recommendations of the Stockholm Conference respond to these principles and point the need for action in the following areas:

(a) Conservation

Emphasis is placed on the development and strengthening of programs for the protection and preservation of renewable resources.

The recommendations include those calling for research in pest, disease and fire control in agriculture and forestry; the development and management of fisheries; the preservation of endangered species and genetic resources; and the recognition of the need for intergovernmental co-operation to extend such protection to migratory species by conventions, treaties and support of the work of international commissions holding such responsibilities.

In the interests of resource conservation, recommendations are advanced which consider;

- the development of available energy sources and new energy technology;
- the stabilization of marginal lands;
- increased emphasis on waste recycling;
- the need for systematic audits of natural resource developments;
- soils, climate and agricultural conditions;
- the need for basic research into the ecological effects of pesticides and fertilizers and the acquisition of ecological baseline data on water, soils, forests, genetic and other living resources;
- the need for preservation of ecosystems for research, and recommendations which emphasize concern for the protection and preservation of genetic resources.

(Recommendations 20, 2l-23, 25, 28, 30, 32, 34, 38, 39, 40, 47, 49, 50, 59-69, 99)

(b) Pollution Control

Control of pollution and re-cycling of wastes require action, including;

- surveys to determine the carrying capacity of the environment for the various effluents and emissions resulting from human activities (including noise);
- the determination of criteria for ambient quality in the setting of adequate objectives and standards;
- and the monitoring and regulation necessary to achieve those standards;
- the control of pollution hazards can be achieved through preventive measures restricting the release of toxic substances;
- maintenance of registries of the environmental behaviour of man-made chemicals and releases of radioactive materials.

Cognizance is given to the control of pollution through intergovernmental co-operation, legislation and other measures, particularly where pollution from national activities affects other nations.

(Recommendations 9, 14, 21, 22, 29, 36, 37, 48, 51-53, 55, 70-94, l00-l02)

(c) Environmental Impact

In order to achieve the social well-being of populations, high priority should be given to the co-ordination of planning and management of human settlements, notably in housing, transportation, water supply, sewage treatment and public health, the mobilization of human and financial resources and the maintenance of community services.

The co-ordination of planning and management of human settlements should be examined in order to ensure minimal environmental impact. Not only must the direct and immediate effects of human activities be subjected to critical analysis, but those far removed in time and place must be incorporated in the planning stages of urban, rural and resource development projects, be carried through to the completion of the planned development, and remain an active consideration in the post-development period.

The environmental effects of man's physical interference with his environment must not be the sole consideration. Consideration must be extended, as well, to those actual or potential effects which may ensue from legislative, political or economic measures.

(Recommendations 15, 18-22, 27, 31, 46, 61, 63, 70, 100-102)

(d) Information Exchange

In its usually accepted definition, "Information Exchange" covers areas of information collection, analysis, storage and exchange. It may also include the role of dissemination of information through training and education.

As applied to the maintenance of a viable resource base, it is used in both senses: it considers the functions of inventory, survey, registry and monitoring, together with the means required to achieve practical realization (networks, remote surveillance and sensing facilities, information banks, referral systems, etc.), as well as the need for making this information available through training programs.

(Recommendations 8, 9, 12, 14, 15, 18, 19-23, 24, 26, 27, 31, 32, 34, 41, 46, 47, 50-53, 55, 56, 61-63, 67-69, 73-82, 84, 85, 100-102)

Implications for Ontario

GLOBAL RESPONSIBILITIES FOR RESOURCE MAINTENANCE

In general, natural resources fulfil the same role throughout the world. They are the fundamental fabric of the earth, a part of the world ecosystem and its cycling of energy, with all the implications of interrelated and interdependent life-support systems.

Man's dependence on the world's resources is acquiring fuller significance for him as these relationships become more deeply appreciated. A new perception of his responsibility for management of natural resources for present and succeeding generations is emerging.

In a more immediate sense, natural resources provide the basis for the generation of economic activity, the ecological framework within which life-systems thrive, and the setting in which recreational opportunities are created. Sound management is premised upon providing a balanced, self-perpetuating and evolving resource base.

Accepting concepts like the "limits of growth", altering such practices as the "freedom of the seas", assessing liability for damages to common property and acting now to preserve resources for the future, will require further changes in the attitudes and momentum of society.

The world-wide desire for growth strains and damages the environment and requires substantial revision of many diseconomic practices. In developing nations where poverty, malnutrition and illiteracy abound, emphasis on development to overcome adversity requires recognition of ends and adoption of practices which are not damaging to resources.

Unfortunately, the disparities of resource consumption are increasing, with the economically developed nations heavily committed to resource consumption. Accelerating and unlimited growth of consumption of finite resources will distort further the imbalance. Global restraint and careful resource-use must be pursued.

All use of energy, mineral and renewable resources for purposes of sustained production and yield should be subjected to critical review to avoid irreversible environmental damage.

Technological changes, including increased recycling of materials, improved product durability and biodegradability, and additional substitution of renewable for non-renewable resources could lead to conservation of resources or, at least, reduce their depletion.

Substitution of synthetic for natural products should be accompanied by safeguards to avoid harmful effects on the environment. To the extent that emphasis is placed on productive management and harvesting of renewable resources for wood fibre and dietary protein, enterprises should be conducted in a manner consistent with maintaining the quality and stability of the larger ambient ecosystems.

In this way, the maintenance and improvement of the capacity of the earth, and the natural ecosystems involved in the use and enjoyment of natural resources, can be reasonably assured.

Generally, the planning of these developments should include the analysis of environmental costs versus economic and other social benefits. The planning should lead to alternative guidelines for use of land, water and other resources, including private as well as public property.

Greater effort should be expended in the carrying out of complete ecological inventories of lands before they enter into planning use or any form of resource extraction or utilization, thus

enabling identification of special and sensitive areas. Environmental design should be a part of all resource planning and no resource manipulation should take place without this multiple-interest analysis and planning.

It would seem most desirable to encourage, at the United Nations level, the development of scientific criteria and the necessary standards with respect to pollutants of global significance. Each nation could co-operate in its special area of expertise by making technology, and other resources available.

At the national level in Canada, the federal and provincial governments should work in concert to determine criteria for environmental quality and, subsequently, pursue the establishment, nationally, of broad ambient quality objectives for air and water.

The Province could then make these objectives as restrictive as necessary to guide efforts directed toward the achievement of its standards of environmental quality.

It will be advantageous for the Province to work closely with the Man and the Biosphere Program (MAB) in contributing to national research directed towards the solution of environmental and natural resource problems. Provincial participation must be clarified, however, in order to achieve a full Canadian response to identified needs.

GOVERNMENTAL RESPONSIBILITIES IN CANADA

Tasks facing governments in Canada may be summarized as follows:

- provision of information and research to aid in the understanding and use of the natural environment.
- guidance of man's developmental, industrial, and service activities to maintain a healthy and attractive natural environment.
- management and use of renewable resources to increase productivity while maintaining diversity.
- wise use and conservation of finite resources to obtain the greatest gain for the Canadian people.
- recognition of the need for intergovernmental co-operation and support of such commissions as the International Joint Commission and the Great Lakes Fisheries Commission.
- provision of support for international agencies with a view to achieving the maximum social,economic and technological betterment of lesser developed countries at minimum environmental cost.

COMMITTING USES OF LAND

The misuse of land contributes to various environmental problems including congestion, land shortages and pollution of air, water and soil. Because of the geographical distribution of land use and ownership patterns, these problems are more intense in the southern part of the Province, particularly in the drainage basins of the lower Great Lakes.

The tendency of these problems to be intensified with further industrialization has prompted Ontario legislation and plans designed to control the rate of growth and patterns of urbanization in the Province (15).[1]

Land management planning requires a basic inventory of the capability of land for optimum use. Important aspects of the inventory should include the state, quality and limitations of soil, existing habitats, marginal lands and forest cover, together with other favourable and unfavourable factors.

Also, existing property uses, demand for and supply of recreation, waste production and indices of environmental quality should be incorporated. Where possible, remote sensing techniques may enhance data gathering (67, 80, 98, 99).

The inventory should also contain information on geology, topography, climatic characteristics and moisture regimes to permit reasonably adequate evaluation of land for planning purposes (66). As proposals are advanced, assessment should be required of the environmental risks involved in locating urban developments, industries, transportation and other utilities (energy generation and transmission systems) in comparison with economic and other derived social benefits.

Since the availability of land has absolute limits, and the commitment of land may not be reversible, encouragement should be given to the reservation of as much land as possible against future options, particularly land suitable for food production, and in areas where the traditional life-styles of native peoples are threatened by resource development, and where the biological productivity of land is problematical.

The opportunities for improved environmental quality are clearly greater where advantage is taken of advance planning before commitments to certain inflexible patterns of land use are made and where human expectations rather than population growth may threaten the prospects for maintenance of the resource base and the quality of life (62).

If emphasis can be shifted to these forward-oriented considerations, the great amount of effort required in major environmental repair and recovery operations could be largely overcome.

With acceptance by the nations of the world of the concept of environmental design and with its incorporation into resource-development planning, a completely new perspective on resource use will have emerged (63).

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[1] *In the text, numbers in brackets refer to the Stockholm Recommendations number. The 109 recommendations are reprinted in Appendices II and III.*

As the Province regulates the use of crown land and water, which comprise about 90 percent of the area of Ontario, it is in a strong position to control use of these resources. Ontario regulates the use of private land by official planning whereby municipalities direct and control the use of lands within their boundaries.

Accordingly, the Province's Design for Development Program recognizes a development-planning hierarchy, incorporating planning guides for government agencies in regions, subregions and official planning areas (68).

Under the Ontario Planning and Development Act, the Province is empowered to prepare regional plans, in close consultation with municipalities and others. The Act sets out a new process of public examination and hearings for design, adoption and implementation of provincial plans in different areas of the Province.

Environmental programs are being designed to ensure the establishment, conservation and maintenance of nature reserves and historical parks, sites and zones.

FOOD PRODUCTION

We eat to live, but food has a much greater impact on the quality of life in any society than simply a life-maintaining force. The food production system is a major contributor to our economy. The social structure that has developed in rural areas where primary food production occurs has stood the test of time, and exerts a modifying influence on the complex social issues resulting from urbanization.

Ontario has enjoyed an abundant supply of safe, wholesome food to the extent that its availability is accepted as a matter of course. Ontario, however, is a net importer of food. The present world food shortage, increasing competition for land for purposes other than food production and a steadily increasing population suggest that Ontario can no longer take for granted the availability of an abundant supply of food for its population.

Ontario is concerned about the increasing competition for the use of its limited supply of food-producing land. Its position is that land in Ontario which is suitable for food production should remain available for food production wherever possible.

Current Ontario policy is to encourage increased food production on every available acre of its farm land. Policies are being developed to encourage the continuance of food production on land now assembled for future urban development.

Systems are being developed to ensure that regional planning strategies and development patterns reflect Ontario's need to maintain an adequate food-producing land base to maintain the contribution its food production system makes to the quality of life.

ENERGY

As demands for energy production, transportation, conversion and use continue to grow, it is clear that environmental risks also tend to increase and must be included in future energy planning and policy decisions. In the past these have been frequently limited to convenience, availability and cost (59).[2]

Inasmuch as Ontario is an "industry rich and energy poor" province, importing most of its energy resources, much of the environmental damage involved in developing and producing energy from primary sources will not occur in Ontario. Eighty percent of the Province's energy requirements in 1970 were met by importation, with local production of petroleum, natural gas and uranium contributing little more than one percent of the total energy supply.[3] Water power remained the major source of electric power generation.

Nuclear sources are expected to gradually displace hydro power in the dominant role. Thus, by 1990, indigenous energy resources, mainly uranium, should account for one-quarter of Ontario's needs.[4]

The price structure of energy purchases in Ontario and elsewhere in Canada has not reflected the true cost of the resource. The rising trend of prices[5] reflects uncertainities elsewhere in the world including oil production cutbacks, the pressure of demand (expected to quadruple by 2000), as well as other problems with supply, costs of exploration and development in remote areas, and pollution-abatement measures. The upward trend is expected to intensify for fuels

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[2] *Report on Energy Policy Needs in Ontario, June 1, 1973 by W. Darcy McKeough, Parliamentary Assistant to the Premier of Ontario, presently Minister of Energy.*

[3] *In 1950, 22.1 percent of Ontario's energy needs was supplied by oil, which increased to 40.7 percent by 1970. Gas consumption rose from 1.2 to 18.7 percent during the same period, whereas the use of coal dropped sharply from 56.9 to 21.2 percent. Water power increased to 25 percent of the total energy supply during the 1950's, but this has been declining in relative importance and stood at 18.3 percent in 1970. Nuclear power in 1970 accounted for less than one percent of Ontario's energy supply.*

[4] *Looking forward to the 1990 supply situation, the most significant development presently forecast is the vastly increased role of nuclear power, namely, about 23.9 percent of Ontario's total energy supply. It is predicted that the contribution of coal will decrease to 6.5 percent. Since nearly all available hydro-electric sites in the Province have been developed, the contribution of hydro-electric power is also expected to decrease in importance to about 6.5 percent.*

[5] *An Energy Policy for Canada Phase 1 - Analysis, The Ministry of Energy, Mines and Resources, Ottawa, Canada.*

imported to Canada and from other Canadian provinces, and for energy produced in Ontario.[6]

Evaluation of the environmental impact of alternative energy and related developments is now accepted practice, including public participation[7](57,60,61). An audit process has been developed for certain environmental influences. However, an integrated impact analysis-environmental audit information exchange should be organized to provide more accurate cost estimates of developing and using resources (62).

Oil and Gas

There is a vital need to ensure that adequate supplies of oil and gas are available for the industrial needs of the Province. Oil production has a small impact on the environment in Ontario but this may change in the future (57). At present, drilling is banned on all of the Great Lakes except Lake Erie, from which gas is taken. In the event that oil production is allowed on Lake Erie, or the other Great Lakes or the Hudson/James Bay Lowland, the environmental consequences could be significant and would have to be evaluated in detail (59, 60).

Several experiences with pipeline breaks, railway mishaps, vessel collisions and sinkings in the Great Lakes have readily demonstrated the potential hazards involved in transportation of oil and other hazardous materials. While contingency plans have been put into effect during these incidents, greater emphasis must be placed on prevention to avoid the serious damages associated with spills of oil and other hazardous substances.

Other environmental problems may result from the inefficient conversion of fuels to useful energy such as discharges from thermal power plants, and industrial and automobile emissions.

Coal

At present, all coal used in Ontario is imported and, hence does not produce any pollution problems from mining processes in the Province. Major energy needs in the near future will likely place continued reliance on coal and oil supplies. It is unlikely that additional natural gas supplies will be available in sufficient volume and low enough in price.

While coal imported from the eastern United States is presently attractive because of relatively low cost and availability, this situation is subject to change. Further, the unacceptable emission of combustible products from the burning of coal interferes with the maintenance of air quality, a factor which will add to the cost of coal as further reduction of emissions is accomplished.

Its wider use will require the use of efficient precipitators for removal of particulates, the development of scrubber technology for control of stack gases, as well as gasification technology.

The Onakawana lignite deposits in Northern Ontario are now being studied as an energy source. If a decision is made to utilize the deposit, environmental considerations will be an integral part of the planning and development.

Uranium

Numerous deposits of uranium-thorium minerals are known in Ontario. At present, however, only two companies are producing uranium from the Elliot Lake area, where waste discharges have had a significant impact on the environment. A similar experience has been encountered in the Bancroft mining area.

Wastewater discharges from active mines and abandoned tailings areas have resulted in increased radioactivity in local streams and drainage systems. Serious chemical pollution, together with sharp reductions in fish populations and other forms of aquatic life, have also been observed.

While the uranium mining industry has done much to correct the problem, future mining operations of this kind will be required to make major revisions in their water-use and waste-disposal practices.

By 1991, it is estimated that Canada may have 30,000 to 50,000 MW of installed nuclear power plant capacity of the CANDU type. In addition, the world's total nuclear power plant capacity may be more than 30 times that of Canada. Consequently, the availability of world markets may

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[6] *By 1990, when Ontario's nuclear program for the generation of electricity will be well underway, the Province will still be 70 percent dependent upon imported energy. Because the present availability of natural gas and crude oil is under the jurisdiction of other provinces (specifically Alberta) and the Federal Government, and the supply of imported coal under the control of United States authorities, the Government of Ontario is giving high priority to the development of a comprehensive and coordinated energy policy to meet the challenge of ensuring an adequate supply of future energy.*

The Government intends to monitor research closely and perhaps initiate research into making coal more environmentally acceptable by means of precipitation, scrubbing, gasification and other means.

[7] *Earlier in 1971 The Task Force on Power Plant Siting, including Ontario Hydro and the Ministries of Environment, Natural Resources, and Treasury, Economics and Intergovernmental Affairs was formed to identify, at an early stage, the repercussions of any siting decision.*

When siting plans become firm, studies are conducted to determine the possible effects of cooling water withdrawals and thermal discharges on the ecology of adjacent water bodies as well as the effect of stack emissions on the surrounding countryside.

Presently, the government seeks public reactions to proposals at an early stage in the planning process through hearings on a given undertaking. Environmental considerations continue to be relevant, even after the power plant is in operation, as is evidenced, for example, by the selective use of fuels to meet air quality criteria and the on-site containment and treatment of waste waters, arising from fuel storage and ash disposal, to meet water-quality criteria.

determine whether a significant quantity of Ontario's uranium is to be mined, and this, in turn, will determine the extent of impact on the environment.

While important strides have taken place in the development of thermonuclear power generation recently, continued advances in securing and developing uranium for the production of energy will be required as markets for electricity grow.

In addition to uranium mining and milling, other activities receiving increased environmental emphasis include fuel processing and power production, together with the effects of thermal discharges, radioactivity and other emissions.

Accidents at nuclear power plants[8] could range from relatively small internal releases of potentially lethal doses of radiation to complete failure of some of the so-called 'failsafe' systems, either by sheer accident or design (wars, sabotage, etc.). These systems depend, in large part, on the proper functioning of many mechanical devices and on key personnel doing exactly what they are appointed to do at the right time.

Many of these systems have not been, and cannot be, tested, under actual situations, so that they could fail when needed, even though the probability is very small. The Canadian CANDU system is reputed to be one of the safest systems in the world but this should not eliminate concern.

The need for close and continuous surveillance of these systems cannot be overstated. Further, contingency plans for dealing with public health and safety should be available in the event of a nuclear catastrophe.

A very important problem regarding nuclear power generation relates to the storage and disposal of waste radioactive products. Some of the products have half-lives of up to 25,000 years or more, and many emit harmful radiation doses for up to a million years. This calls for a reliable system of protection against nuclear wastes which will be effective for at least ten times recorded history.

The implications are very large. How can future generations be guaranteed against possible large-scale radioactive poisoning? Many proposals for the disposal of the ultimate wastes produced by nuclear fission have been put forward, but most are, at best, relatively short-term solutions (10-100 years).

The assumption is that technology will advance rapidly and scientists are anxiously devoting themselves to the problem.

As yet, however, no solutions have been put forward that satisfy the critics. A satisfactory solution must be found before there is a massive commitment to nuclear power—at least to those types of nuclear power which yield the more dangerous wastes.

[8] *Advisory Committee on Energy, March 5, 1973 Volume Two*

Here also the CANDU system now being used by Ontario Hydro has important advantages over other systems.

Hydro Power

While water power sources will gradually contribute less and less of the total energy supply, they are increasing in importance because of the peak load capacity they provide. It is under cyclical conditions of peaking and ponding in large reservoirs that the greatest environmental interference with human, plant, and wildlife occurs.

As a result, these factors will be paramount in future considerations at existing sites and in development of the remaining sources of hydroelectric power in Ontario.

Alternative Energy Sources

The use and rapid depletion of energy resources requires taking steps to ensure more efficient use of existing energy supplies. Development of the 'non-conventional' resources, with minimal environmental impact, should be considered as possible future sources of energy. The following might be considered:

(a) Fusion

The use of fusion power has the highest potential in producing unlimited energy resources because there is an almost inexhaustible source of deuterium in sea water. Considerable research is under way, although there are various stages of development which this process must undergo to prove its reliability, safety and environmental acceptance.

From an environmental standpoint, this method of generating power is desirable as the reaction gives off non-radioactive gases. However, it requires large quantities of heavy water, the production of which, at the present time, involves hydrogen sulfide, a dangerous gas and hazardous water pollutant.

Other processes for heavy water production are being investigated, including the use of hydrogen-amine processes.

(b) Enriched Uranium

Although enriched uranium may not be required for the CANDU system, future world demand for enriched uranium could dictate the installation of enrichment plants. These plants have a high potential for producing air-quality and water-quality problems.

(c) Fast-Breeder Reactors

While the successful introduction and widespread adoption of fast-breeder reactors will reduce the need for uranium, solutions must be found to problems associated with the production of radioactive wastes before this energy system can be put to productive use.

(d) Solar or Wind Energy

Direct conversion of sunlight is an environmentally-ideal power source. However, this

energy is at such a low power density that a 1,000 megawatt plant with existing technology would occupy an area of 16 square miles. Other methods have been advanced for using solar energy. These methods will require extensive refinement before either solar or wind energy can be utilized commercially.

(e) Burning Garbage

Possibilities of burning garbage as an energy-producing fuel have been under investigation in Ontario. This has led to the development of a firm proposal for power generation at the Ontario Hydro Lakeview Generating Station.[9]

Conservation of Energy

Increasing consumption patterns suggest that the environmental impact of energy use will become increasingly serious in the future. Reduction of unnecessary consumption of energy, therefore, provides an effective strategy both for conservation and pollution abatement.

Employment of available forms of energy in applications for which they are best suited, and reduction of unnecessary and wasteful practices common in air, land and water transport, and general domestic, commercial and industrial activities should be actively pursued. A forward step was taken recently in this regard by Ontario Hydro by curtailment of advertisements promoting increased electrical consumption.

One of the greatest energy inefficiencies in modern society is the use of high-powered vehicles particularly in cities. Automobiles are substantial consumers of energy and contribute to air pollution as well as community noise.

It is probable that environmental goals can be achieved more readily through development of public transportation systems than by pursuit of controls over large numbers of automobiles.[10] Promotion of public transportation with complementary de-emphasis on automobile size and numbers, would reduce gasoline consumption significantly.

Some space heating in Ontario involves direct use of fossil fuels. Insulation is a major factor in determining the amount of energy needed to heat a building and, consequently, indirectly affects the amount of pollutant emission near ground levels. Houses designed for electrical heating are better insulated in order that this heating method can be economically competitive.

If similar insulating standards were adopted in homes heated by fossil fuels, the energy saving and reduction in air emissions would be considerable.

USE OF MINERAL RESOURCES

Mineral wealth and a favourable investment climate have contributed significantly to the high level of prosperity enjoyed by Ontario residents and have made Canada, as a whole, one of the most economically favoured nations in the world. Mineral exports account for about one-third of Canada's total exports.

Ontario mining operations employ 40,000 people directly, and an additional 20,000 indirectly, and produce minerals and metals valued at $1.5 billion annually.

Rehabilitation of mine areas is an accepted part of mining operations today and extensive measures are directed towards the maintenance of environmental quality.

Recognizing that only a portion of the ultimate value of mineral resources is associated with the mining process, the Mining Act of Ontario requires that all ores or minerals mined in the Province "shall be treated and refined in Canada" so that Canadian people will gain by employment and other associated benefits. Some of the benefits of domestic secondary processing may be offset by damage to air, water and soil and associated fauna and flora.

Several areas in Ontario have been damaged by uncontrolled smelter operations. Environmental assessments have been conducted by the Ministry of the Environment and remedial programs recommended (56).

Such programs are under way at existing mine and mill sites and research directed toward reduction of the environmental hazards associated with new smelter-refinery complexes is being conducted.

Land Use

While the Mining Act of Ontario regulates the use of provincial lands for mineral exploration and mining purposes, mineral rights are also subject to other land-use factors. Mineral rights have been withdrawn for park purposes over large areas of the hinterland. Official plans for municipalities in the near-urban areas are moving towards complete prohibition of surface mining operations.

As mineral deposits can be recovered only where found, consideration should be given to the development of suitable performance and reclamation standards for mining activities, especially in areas where multiple use is made of lands.

Because mineral resources are finite they must be conserved and used wisely to provide maximum benefit. Mining is a temporary use of

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[9] *"Watts from Waste" — A co-operative project involving Ontario Hydro, the Ministry of Environment and the municipalities affected.*

[10] *The Ontario Government has commenced development of an intermediate-capacity transit system and has contracted for completion of an experimental system at the Canadian National Exhibition by 1975. Refer also to Chapter 2, Transportation and Communications.*

land, planning should provide for its sequential use. The mineral resource can be removed and stockpiled and the land rehabilitated for other use.

If these activities were carried out in a minimum period of time, especially in populated areas and where other restrictions did not prevail, disturbance of land and inconvenience for the residents involved might be kept to a minimum (56).

The Niagara Escarpment Protection Act was enacted, in part, to control surface mining on what is one of the Province's most unique and attractive natural features. It was supplemented by the Pits and Quarries Control Act, which provides for performance standards and land rehabilitation in any designated area.

The Niagara Escarpment Planning and Development Act sets out the design, adoption and implementation of a plan for the preservation of the natural landscape of the escarpment, including a system of development controls.

Fragile Environments and Preservation of Natural Areas

The Province recognizes the need for protecting certain natural areas including fragile environments and other sensitive areas by incorporating any necessary conditions in the terms of exploration licenses and mining leases (56). The province seeks to ensure minimum disturbance to the land, the avoidance of unsightliness, and inconvenience to others. This principle is embodied in the Niagara Escarpment Planning and Development Act noted previously (56).

AGRICULTURE

Land Use

Ontario recognizes the need to identify the demands on agricultural lands and to safeguard them against abuse (19). Land-use policies are being developed to ensure adequacy of future food supplies while maintaining a wholesome rural environment.

This is being encouraged through a number of programs designed to promote the development and maintenance of well-run farms, the growing of high quality disease-free crops and livestock, and the provision of pleasant up-to-date buildings kept in good repair (19).

It is important that the renewable resource of soil be safeguarded to maintain an adequate food-production base to feed the expanding population. Losses or mismanagement of soil must be avoided.

Policies are being developed in Ontario to maintain this fundamental resource. Soil and cropping programs within the Province are being adjusted to conserve the largest acreage of productive farmlands in the face of increasing urban encroachment, industrial development and public utilities — all of which compete for good agricultural land.

New machinery is being developed to minimize the amount of tillage necessary to produce cereal and grain crops. Improved management techniques are being implemented to establish legume and grass crops in roughland pasture areas, circumventing the need to break up soils in order to reseed. For example, birdsfoot trefoil is an excellent crop for roughland pasture areas, where large numbers of beef cow-calf herds and dairy herds are maintained to meet expanding needs for beef and milk.

However, the inheritability for seedling vigour is low, thus necessitating extensive progeny testing in order to identify superior plants that can be used in roughland pastures.

Soil Improvement

The improvement and maintenance of the capacity of soils to produce renewable resources is foremost in the agricultural programs within Ontario. There is an expanding supply of information on soil mapping, soil management and plant nutrition being made available by research facilities, with a view to improving the quality of food production, as well as increasing the quality of field, vegetable and greenhouse crops (21). Methods to predict crop nutrient requirements to reduce and keep to a minimum the nutrient loss by runoff or percolation into groundwater are known but the problem of education is not complete yet. The release of nutrients from soils and organic wastes is affected by weather as well as by management.

Future recommendations for nitrogen requirements should result in more efficient use of applied nitrogen. This, in turn, would result in reduced fertilizer costs per bushel of corn (or ton of silage) and minimize nitrogen pollution of groundwater.

Genetic Resources

The crop-breeding establishments of the Ministry of Agriculture and Food maintain an active genetic pool which is part of the world collection of barley and corn varieties and keep a register of all other grains. These materials are constantly being used in breeding programs.

The University of Guelph maintains a viable supply of such grain varieties. Somewhat the same is being done in legumes and grasses but on a more limited basis. Breeding stocks in soys are being maintained by the Canada Department of Agriculture. All are distributed to other breeders world-wide. Stocks are maintained as required.

In livestock, the University of Guelph, for example, is maintaining a herd of Finnish Ayrshires to preserve and evaluate their genetic capabilities for possible use in future breeding programs in the dairy industry.

In beef, the exotic breeds are being imported for possible use in breeding programs. In swine, genetic sources from the United States are being

used to supplement breeding stocks developed and maintained in Canada.

Since the sale of livestock and livestock products is the main source of income to Ontario farmers, the following programs are maintained to promote improved production and quality of livestock: (23) (39)

- The Artificial Insemination Program provides financial assistance to A.I. Units which produce superior sires.
- The Beef Cattle Performance Testing Program identifies superior beef bulls and superior herds.
- A Bull Premium Policy provides financial assistance to purchasers of superior breeding stock.
- A Dairy Herd Improvement Program identifies superior milk producers and the analytical data identify superior sires.
- Consignment sales receive financial assistance when the entries have been approved as high-quality breeding stock.
- The Sheep Assistance Policy (Federal-Provincial) encourages transportation of breeding stock from Western to Eastern Canada.
- A Performance Testing Program is available to all sheep breeders to help identify fast-gaining breeding stock.
- A Ram Premium Policy encourages the use of good quality purebred rams.
- A Performance Testing Program for swine makes possible the selection of the highest quality rapid-growing pigs for breeding purposes.

Pollution Control

Programs have been developed to reduce discharge of pollutants on soils in Ontario to provide environmental protection and avoid damage. Agriculture is aware of its contribution to the pollution problem, particularly in the areas of odours and water pollution, associated primarily with the production, storage and utilization of animal wastes.

There is an increasing trend toward more intensive livestock and poultry enterprises. These have not always been accompanied by comparable increases in acreages for manure utilization. A program, therefore, had to be developed to overcome serious odour problems and the manure disposal problems which could develop.

The program requires sufficient land area be provided on which to spread manure; sufficient manure storage capacity to hold the manure until it can be properly spread on the land at appropriate times; sufficient separation between livestock and poultry buildings, manure storages and neighbouring dwellings; management guidelines in keeping with existing knowledge of the storage, handling and use of animal manures; and guidelines for dead animal disposal.

The Agricultural Code for the disposal of animal wastes is based on the concept that manure should be returned to the land to grow future crops, but the code emphasizes that land can only accept a certain amount of manure without increasing the potential for water pollution.

The code should be expanded to encourage the planting of permanent crops such as hay in the vicinity of watercourses to reduce probable erosion. Where erosion of the streambank is likely, consideration might be given to restricting the access of livestock.

Pest Control

Pesticides are not equally toxic to all insect and plant species. Thus, pesticides are evaluated, for example, to determine the ones that can be used in orchards and fields without killing the beneficial insect and plant species (21). Lower dosages are being evaluated to determine if adequate control can be obtained with minimum side effects. Lower rates of application of certain pesticides have been recommended for some crops.

An important program was introduced in 1973 to reduce the availability of very persistent and extremely toxic pesticides to the public, in an attempt to reduce the hazards inherent with the abuses of pesticide use (21).

Recent technological advances in insect control include the development of pheromones that can be used to attract insects, and accurately monitor their populations (21). This has been shown in the case of such pests as cabbage looper, red-banded leaf roller, codling moth, apple maggot, cherry maggot and European corn borer which contribute significantly to economic damage. By improving the estimates of insect populations, more selective use can be made of chemicals by agricultural producers.

Municipal and Animal Waste Utilization

Solid animal waste has a low carbon:nitrogen ratio for good composting, while sorted municipal garbage has a high carbon:nitrogen ratio. Experimental research work is underway to combine these two troublesome wastes into a compost acceptable to home gardeners (20,22). This research work, and similar programs, are designed to develop better methods of handling agricultural wastes generated by commercial farming enterprises.

Farm Machinery and Environmental Concerns

An expanding program within Ontario will help agricultural producers determine the optimum size of power units to perform the work functions.

It utilizes a computerized problem-solving technique known as Comsolve. Farmers are advised the maximum size, type and capacity of machinery they should purchase, based on farm

location, types of soils, availability of labour, number of acres, and other criteria.

Optimizing equipment decreases costs of operation, reduces the amount of fuel and energy consumed and increases the efficiency of farm operations.

FORESTRY

Forests cover a major proportion of the total land area of Ontario. They are a renewable natural resource which is the raw material for a great variety of industrial uses, while stabilizing and improving man's outdoor environment and helping to meet his recreational needs. The goal of the Government of Ontario is to provide opportunities for outdoor recreation and resource development for the continuous social and economic benefit of the people of Ontario and to administer, protect and conserve public lands and waters.

More specifically, the objectives of sound forest management to meet the multiple needs of the people of Ontario are: to stimulate and regulate the utilization of the annual harvest of wood fibre by the wood-using industries; to produce the wood-fibre requirements of industry into the twenty-first century; and to provide healthy forests and trees which contribute to varied recreational opportunities and improve the quality of man's environment as well as provide a home for wildlife.

Forests in Ontario are in an early stage of transition to regulated forests. During the past twenty years the forest manager has been preoccupied, primarily, with planning and organization to obtain forest production. Only recently have the demands of industrial and environmental forestry become competitive. Forests must now be managed for a multiplicity of purposes to achieve the greatest total net benefit for society.

Consideration of alternatives to wood fibre have been evaluated (64). However, liabilities in the use of these involve the use of non-renewable resources, their non-biodegradability and their requirements for significantly higher energy inputs for conversion into consumer products.

In co-operation with other governments, Ontario is involved in programs of research and information exchange concerning forest fires, pests and diseases.

The Ontario program includes data collection and dissemination, identification of such potentially hazardous areas, and the means of suppression; information exchange on technologies, equipment and techniques; research, including integrated pest control; a determination of the influence of forest fires on ecosystems and the impact on resource management; establishment of a forecasting system; seminars and study tours, and bilateral agreements for forest protection with adjoining states of the United States and with Manitoba and Quebec.

Land Use

In planning for use of forest lands, the Ontario Government identifies the land base required to implement its forest production policy. The Government reserves from industrial logging areas, marginal lands and established nature reserves, including areas where recreational, historic, aesthetic and ecological values equal or exceed timber values.

Proposals are reviewed at the district, regional and provincial level before determination of final use. Forest management practices are modified due to site conditions, wildlife management needs, recreational opportunities and aesthetics.

The intensity of forest management is increasing. The development of specific targets for forests will permit a better determination of species priorities and allocation of resources. Programs of artificial regeneration and stand improvement are receiving increasing support.

Rapid regeneration, stand improvement, and cut modifications, together with adequate fire protection, prescribed burns and the careful use of pesticides, all combine to protect and rehabilitate, when necessary, the forest environment and to accelerate the production of wood fibre for industrial use.

Extensive use is made of aerial photography. This is being expanded to include satellite and supplementary photographic systems for monitoring and inventory purposes.(25). Studies of the effects of logging, fire, pesticides and fertilizers on the land and water base have been started (26).

The results of this work will be coupled with the nature-reserve and representative-ecosystem programs to provide further information on terrestrial ecology, the effects of forest operations on various ecosystems, and the identification of major environmental problems associated with them (27).

Competition for the use of land is growing, but available areas are finite. Until recently, forestry was little affected by pressures upon forest land. In Southern Ontario there has been a net gain for forest land due to diversions of marginal farmlands to forestry.

Conversely, urbanization is increasing pressure upon the land base. The forested areas are subject to heavy demands for recreation, aesthetics and wood products. Some of the extensive northern forests are affected by mining operations and the treatment of ores.

Undoubtedly, the fastest growing demand upon land is for outdoor recreation. Other needs and values, including aesthetics, preservation, conservation and environmental protection, are not often quantified but are growing concerns and are receiving increased public attention.

Soil Improvement

Soils are basic to vegetative growth and an understanding of them is essential to forest man-

agement. As greater knowledge is gathered on soil characteristics and limitations, it is possible to bring a forest from a wild towards a regulated state. The purpose of the Ontario land inventory is to map and describe soils and indicate their productive potential not only for forest production but for other uses as well.

A great deal of emphasis is being placed in Ontario on site preparation for regeneration and a better matching of tree species and techniques of regeneration with the soils. Research is being carried out on forest fertilization, in co-operation with the Federal Government and the forestry industry, to develop techniques and the knowledge required to improve forest soils in order to increase fibre production.

Fire Control in Ontario

The objectives in fire control are to prevent loss of life and to ensure the preservation of property, aesthetics and forest values from uncontrolled fires. The Government of Ontario has advanced its fire control capability by technological, organizational and system improvements to the point where fire can be managed as an aid to silvicultural and wildlife management programs.

Ontario presently maintains continuous data collection on fire statistics and disseminates this information nationally through the Canadian Committee on Forest Fire Control and the Canadian Forestry Service (26).

Information exchange on technology, equipment, techniques and research activity is disseminated nationally and internationally through agencies such as the North American Forestry Commission. Bilateral agreements for fire control along the Province's boundaries exist with the Provinces of Manitoba and Quebec, some U.S. States (18) and the U.S. Forest Service.

There is close liaison with North American programs through seminars, study tours and training sessions. Informal arrangements for mutual aid assistance also exist with fire control organizations in Canada and the United States.

Ontario is interested in expanding present mutual arrangements on an international scale where feasible. An organization should be formed to make aircraft, water bombers and crop sprayers available for forest fire and pest control on an international basis.

Pest Control

The general principles of pest control outlined in the section on agriculture apply equally to forestry (21). However, pest control standards are lower in forestry than in agriculture because edible crops are not involved. The impact of pests on the tree is the principal consideration. This means that pesticides are used in much lower quantities and in a less intensive way.

Most forest insects and disease outbreaks are allowed to run their course where it is known from experience that tree mortality or damage will not be significant. For example, the most important forest insect, the spruce budworm, is subject to some high priority spraying under carefully controlled conditions, but only a very small proportion of the total area affected by the insect is sprayed.

Other insects requiring some degree of control are the white pine weevil and several species of pine and spruce sawflies. The major tree diseases in Ontario are the white pine blister rust and the annosus rootrot of pine plantations, but control of these involves a very low intensity use of protective chemicals.

Genetic Resources

Seed zones have been established in Ontario for many years and seed collections from mature stands are maintained on this basis to ensure that seeds and trees from forest nurseries are returned to the appropriate zone. There is an increasing growth in the establishment of seed production areas where the stands are managed for seed production and poor quality trees are removed.

Gene conservation is maintained by regenerating seed production areas with their own seed and by encouraging natural regeneration from adjacent stands. The establishment of nature reserves, wilderness reserves, representative ecosystems, islands and wetlands all aid in the maintenance of a broad genetic base. (39).

Steps have also been taken to establish gene banks of individual species of Southern Ontario hardwoods.

Tree breeding, or controlled evolution, has been used over the years to improve the genetic quality of future trees.(28). In 1972 a major review was undertaken by Ontario, in conjunction with the Petawawa Forest Experimental Station, Canadian Forest Service, to determine priorities by species and the allocation of resources to the various methods of improvement.

This review will be used as a guide to program development over the next ten years. The major species considered were black spruce, white spruce, jack pine, red pine, white pine, poplar, shade trees, other conifers and tolerant hardwoods.

Methods of improvement considered include provenance tests, seed collection areas, seed production areas, seed orchards and progeny tests, super seedlings, interspecific breeding, production tests plantations, including difficult sites.

Preservation of Natural Areas

The Government has, as an objective, the identification and conservation of unique or representative physical, biological, cultural and historical areas of the Province.

The nature reserve program protects and preserves representative and unique life and earth

science features, or ecosystems, for non-destructive scientific and educational purposes (24). The program consists of first defining what is "representative" and "unique", identifying appropriate areas, and reserving them under the Provincial Parks Act or as Crown Reserves under the Public Lands Act.

The location, identification, description and evaluation of candidate areas requires a high degree of expertise involving a wide variety of scientific disciplines. Generally, this program is concentrated within the Provincial Parks and Park Reserves, with further work under the International Biological Program being done on a smaller scale on areas beyond parks and reserves.

Fragile Environments

Fragile environments have been identified through forest and land inventory programs. Extremely sensitive areas are considered as protection forest and either removed from forest production or subjected to restrictions.

In general, marginal areas are subjected to modifications in use and management. The development of appropriate operating equipment, silvicultural techniques and suitable species for these areas is under study (28).

The impact of both recreational and industrial activities on nutrient loss and erosion in fragile environments is also being examined. The capacity of fragile environments to support recreational activities (29) is of concern and attempts are being made to modify their use.

FISHERIES AND WILDLIFE

The Ontario fisheries and wildlife management and research programs must primarily respond to the welfare and needs of the people of Ontario and Canada. However, the Province's total resource base is such that it can contribute to the needs of others who are less well endowed.

Through provision of leadership, training, expertise, and the participation of scientific staff, assistance can be given to underdeveloped nations to assist in the economic and cultural use of their renewable resources.

Certain general biological considerations are pertinent to management of fish and wildlife resources, and to the flora as well due to its significance as the major habitat. Detailed knowledge is required of the biological characteristics of each species, including its physiology, behaviour, genetic characteristics, pathology and critical habitat needs.

Since no species stands alone, its status as part of a particular ecosystem must be understood (29). No fish or wildlife species can be understood except as part of a complex web of organisms.

Preservation of a dynamic ecosystem depends upon identifying objectives and relating these to the biological inventory and limitations for each species of significance. Effort must then be directed to maintaining the ecosystem in a state where it yields the values anticipated in the statement of objectives.

A number of fish and wildlife species are of particular interest scientifically and culturally. Endangered species are a special case. For scientific and other reasons these are usually of international interest.

Fisheries

Management effort for the inland waters of the Province is directed towards obtaining the essential limnological and ichthyological characteristics of 250,000 lakes, varying in size from a few acres to several hundred square miles(49). While, by far, the greatest number of inland lakes and streams provide recreational fishing only, a number in northern Ontario as well as the international waters support commercial fishing.

A continuing inventory of habitat and stocks in the inland fisheries program is underway, as well as a gradual rehabilitation and development of the fisheries. However, the latter is impeded by lack of biological information.

The artificial rearing of fish in hatcheries is undergoing modernization with a program directed towards selective breeding, using preferred genetic stocks, pathological studies and improvement of nutritional standards. Research must be intensified and its application in the management program increased.

The Great Lakes present serious problems requiring large scale inter-agency attention because of their international importance. The fish communities of all the lakes now reflect the impact of a number of major man-imposed stresses (49).

Lakes Superior and Huron communities have been stressed by heavy fisheries exploitation and by invasions of non-active species such as smelt, alewife and the parasitic sea lamprey.

While these stress effects are also evident in Lake Erie and Lake Ontario, additional serious stress has resulted from the physical-chemical alteration of these bodies of water. These effects vary, depending on the basic lake characteristics.

Lake Erie, a shallow, large mesotrophic lake, has had a history of changing and degrading species succession, whereas, fish communities in Lake Ontario, a deep, cold oligotrophic lake have collapsed, essentially without succession except in the limited shallow water zone.

This situation poses questions concerning restructuring of new fish communities, including how to control introduction of new species as well as the level of exploitation in a "free entry" system. New research into restructuring new fish communities is required (40). A management system providing more precise control of species introduction and exploitation levels is required as well (46) (50).

Wildlife

While fisheries management is concerned with the physical, chemical and biological characteristics of lakes and streams, wildlife management relates to the entire land mass and a substantial portion of the aquatic environment of Ontario as well. Wildlife populations reflect clearly and quickly the state of the habitat at any particular point in time.

Habitat is the key to wildlife population. Without good habitat, wildlife cannot exist in any numbers. Competition with other uses of land, notably urban development, has resulted in the destruction of habitat and the reduction of wildlife populations.

Agricultural technology, together with increased efficiency and economic considerations, have led to a trend toward monoculture, wetland drainage and fencerow removal with resulting significant losses to wildlife.

It is estimated that by 1950 over half of the poorly drained soils in southern Ontario had been cleared or drained. Between 1950 and 1968 an additional one quarter of the remaining woodlots and wetlands were converted to other uses and thus lost as wildlife habitat.

In northern Ontario changing timber practices and increased efficiency in detecting and controlling forest fires have significantly reduced the amount of new range being produced from those sources. At the same time, forest maturation on existing range is resulting in a deteriorating quality of habitat for many wildlife species.

Although, in the past, management efforts were directed primarily toward enforcing the laws on consumptive use of the wildlife resource, over the past two decades the emphasis has shifted to habitat management. One major problem facing wildlife managers is the lack of land-use controls to ensure continuing habitat production on, and public access to, wildlife resources on high capability private lands.

Objectives for management and a wildlife planning program are being established. The planning program is greatly facilitated by wildlife land-use capability, and habitat-suitability evaluations which have been carried out throughout much of the Province (29) (40).

In addition, basic research in animal behaviour, genetics, pathology, physiology and ecology continues in an effort to better understand how to manage the wildlife resource effectively (39).

Continuing co-operation on a national scale with the Federal Government and with other provinces is practised with respect to the protection of polar bear and caribou, and on an international scale with respect to migratory birds and polar bear.

Recreation

At present, wildlife and fisheries resources provide 50 million recreation days to Ontario residents. If the supply of recreation is to be maintained and augmented to meet increased demand, modification of land use is essential. Land-use plans can be readily adjusted to retain recreational and economic values of wildlife and fisheries (30) without significantly reducing the economic values for agricultural and forest production.

Development of access to private lands, in many cases, is necessary to permit public viewing or harvesting of wildlife resources within reasonably short distances of urban centers.

Interpretive programs, which are essentially educational in character, are required to help put all natural resources, including wildlife, in perspective with the economic and cultural activities of the country in order to keep people in touch with their heritage.

PARKS AND PROTECTED AREAS

The provincial Parks system in Ontario is dedicated to environmental preservation and appreciation (primitive parks, nature reserve parks, historical sites). The availability of a high quality outdoor recreation program and the preservation of the natural and cultural fabric, both of which contribute greatly to the quality of life in Ontario, result from an advanced environmental planning program.

The primitive parks (wilderness) contain large representative areas of natural landscapes set aside for posterity to provide opportunities to enrich and expand outdoor knowledge and recreational experience. By providing an outdoor laboratory for non-destructive scientific study of natural wild conditions, a variety of human needs are met.

Nature reserves in Ontario are dedicated to the protection and preservation of both representative and unique life and earth science features or entire ecosystems (38). These features are best realized if the reserves contain the total range of habitats, species and landforms. This will assure the preservation of genetic material, and other factors, for future discovery and use, as well as providing benchmarks from which to evaluate understanding and management of the environment.

Historical sites conserve locations which best represent human prehistory and the history of the Province.

Planning of parks leads to the establishment of environmental values and a knowledge of constraints in relation to other social, educational and recreational factors in eventual park utilization (36). Environmental planning includes the gathering of a wide range of data from literature search and field inventory, through synthesis, to weighting, mapping and zoning (40).

Through special short-term training courses on wildlife management, Ontario could more actively promote field training for representatives of developing and other countries. As well as

employing the training facilities of the Ontario Forest Technical School, the Province could work more closely with the developing countries to ensure that those taking such training would be ones in a position to apply the benefit directly in the field (3l). Participation of Canadians in the school systems of developing countries may be a preferred form of assistance.

Through the International Biological Program (IBP) which has, as its objective, the location and identification of highly significant and valuable natural areas and ecosystems, worthwhile exchanges of information between agencies of government have enhanced a number of planning and utility programs (37) (38).

ENVIRONMENTAL PROTECTION

The natural environment can and does act as a "sink" for waste material, whether of natural or man-made origin but the natural environment has a limited capacity for "self-cleansing". It also provides the resources which are used. Standards for environmental quality are, therefore, based on the "health" of the natural system, or ecosystem and permit some alteration of environmental quality.

Technology will permit man to organize more efficiently his use of the environment as a "sink", but this use must be balanced by limiting the use of the resource.

The natural environment is, and must be viewed, as a balanced system which embraces air, water and land and which supports complete and inter-related ecosystems. An alteration in one part of the system can have totally unexpected results in another area. The environment must be managed with these basic principles in view and, as its quality is enhanced, a wider range of environmental use becomes possible.

Population growth and human activities have placed increasing demands on Ontario's natural environment. Until quite recently, neither the need for "growth" nor the cost and effects of growth have been adequately assessed. The growing public interest in environmental protection has stemmed, primarily, from a concern over the degredation of the "natural" environment.

The effects created by the facilities men have constructed contribute to land shortages and congestion and have unforeseen effects on air and water quality. They have resulted in noise pollution and have had serious impact on soil and land use.

In addition, environmental standards have become increasingly more stringent, and greater controls over the alteration of environmental quality are becoming essential as man becomes more knowledgeable about his discharges to the environment and its limited capacity to "cleanse" itself.

The environmental action plan may be described as a collective effort of all ministries and agencies of government to ensure the optimum balance between the enjoyment and use of the desirable qualities of the environment with minimum detrimental result.

Toward that end, a number of strategies must be pursued to address the tremendous variety of problems created by man's impact on the environment. Four strategies are in current use:

- The control of emissions of contaminants into the natural environment with the objective of achieving or maintaining standards of environmental quality (14, 53, 72-77, 79, 83, 85, 87-88, 90, 91).
- The enforcement of preventative measures against damage to the environment, and surveillance to ensure that safeguards for the environment are observed (53, 54, 63, 71).
- The encouragement of improved utilization of resources to minimize the production of waste products and the degredation of the quality of water (9, 10, 53, 86, 92).
- The development of specialized measures or agreements for restoration and enhancement of environmental quality where required (3, 51-53).

The development and establishment of environmental quality objectives or standards is essential for environmental planning, and analyses of environmental impact of proposed projects.

Currently, environmental quality standards are recognized by the Ministry of the Environment, either by policy declaration or agreements, and form a basis for the planning of safeguards for air quality and the water quality of the Great Lakes and inland waters.

Environmental quality standards are under constant review and may be altered in response to new information or as shifting social values require.

Originators of projects with an environmental impact should assume the responsibility for preparing an analysis to demonstrate that a waste effluent, emission or deposit meets regulatory requirements. Such regulatory requirements should be set so that concentrations or conditions in the receiving environment will be harmless to users of air, water and soil.

The legislative base for environmental controls should be reviewed by the ministries responsible on a regular, systematic basis, to check its current relevancy and adequacy, and ensure its objectives are being achieved.

Several provincial statutes administered by various Ministries including Natural Resources, Environment, and Agriculture and Food contribute to the management of water through regulation of drainage, flood control, flow augmentation, water quality, water quantity and the construction of structures or impoundment associated with watercourses.

There is a particular need to maintain regular review of several acts such as the Environmental Protection Act, the Ontario Water Resources Act, the Lakes and Rivers Improvement Act, Conservation Authorities Act, the Drainage Act, and the regulations relating to the construction of farm ponds.

The Air Environment and Its Management

Ontario has adopted the most comprehensive air pollution control legislation in Canada. Regulations express maximum permissible concentrations of the commonly recognized urban airborne contamination as well as air quality goals that shall be achieved and maintained (81). They also express the rules under which malodours and smoke may be suppressed, whether or not they can be described in numerical terms.

This is in keeping with the Ontario policy of providing air of a quality consistent with a high quality of life. The criteria consider effects of airborne contamination on visibility, injury to vegetation, the soiling or tarnishing of property, offences to the senses of sight and smell, and, of course, effects on human and animal health.

A substantial air quality monitoring network exists throughout the province. The network is greatly strengthened in those areas where air pollution has been observed to occur. This includes the telemetering of air quality data to the central office computer.

The province has pioneered in the development of many new air quality monitoring techniques and participates with the federal government in studies of remote monitoring techniques. (79).

The impact of processing resources and using energy is the dominant factor affecting the quality of the air. Many emitted contaminants pollute the air, particularly in urban centres. Five major pollutants comprising particulate matter, [11]sulphur dioxide, [12] carbon monoxide, [13]oxides of nitrogen [14]and hydrocarbons, [15]are monitored by the Ministry of the Environment (57).

Emission data from a multitude of sources have been compiled and included in a computerized emission inventory file. This file is used as a basis for predictions of air quality in the inventory areas. Priorities of abatement of harmful emissions and the necessary controls of new emission sources may be established from the data.

In co-operation with the Federal Government, studies are being conducted on air quality criteria, resource development and meteorology and environmental impact (66) (70) (81) (83).

Firm commitments have been made by federal, state and provincial authorities to achieve air quality objectives proposed by the International Joint Commission in its report on transboundary air pollution problems in the Detroit-Windsor and Port Huron-Sarnia areas.

It is expected that IJC will review and report any time it deems necessary on the state of air quality and source of emissions, adequacy of surveillance and measures to respond to incidents.

While it is not technologically or economically feasible for the Province to examine all potentially-deleterious substances that are produced, marketed or used in the Province, so as to eliminate all environmental degradation from these sources, Ontario does have numerous programs to identify toxic and dangerous substances.

However, an internationally co-ordinated program for the identification of such substances, and the development of a system to disseminate the findings of such a program rapidly and accurately, is needed with the participation of the nations of the world (74).

This could include the provision of available air quality data for early warning (76) and the exchange of information and research (77). In addition, consideration would be given to any additional monitoring which might be required to supplement an international network.

The Water Environment and Its Management

(a) Water Supply and Demand

In Ontario, about 187 billion imperial gallons per day (BIGD) of surface and ground water flows from the province's 363,282-square-mile land area. From this total available water resource, cooling water withdrawals for thermal

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[11] *Annual particulate matter emissions in 1972 for Toronto and Hamilton alone were 50 million pounds for each city.*

[12] *In 1970, fossil-fuelled generating stations in Ontario emitted about 400,000 tons of sulphur oxides. With no controls, the annual figure would be approximately 1.4 million tons by 1990; however, if controls are instituted in the mid-1970's, the 1990 projection will be about 700,000 tons per year. Annual automotive sulphur dioxide emissions are relatively small, being about 7,800 tons in 1970 and projected to 18,700 tons in 1990. In just the two cities of Toronto and Hamilton, total annual sulphur dioxide emissions in 1972 amounted to 500 million and 75 million pounds, respectively.*

[13] *In 1970, in Ontario which had an automobile vehicle population of 2,625,000 approximately 2,487,000 tons of CO were emitted. By 1990 annual carbon monoxide emissions from automobiles are projected at 5,600,000 tons without controls. Assuming implementation of present enforcement measures, the 1990 total automobile carbon monoxide emission will be 717,000 tons per year.*

[14] *In 1970, fossil fuel generating stations in Ontario emitted about 75,000 tons of nitrogen oxide with the total in 1990 expected to be 200,000 tons per year. Total automotive emissions in Ontario during 1970 were estimated at 127,000 tons. Without emission controls the figure would increase to about 358,000 tons per year by 1990 whereas, with controls the level would amount to 29,000 tons per year in that year.*

[15] *About 364,000 tons of hydrocarbons were emitted from Ontario automotive sources in 1970. Without emission controls this would increase to 819,000 tons per year by 1990, whereas, with controls, the emissions would amount to 82,000 tons in that year.*

generating stations are, by far, the most significant, being about 2.3 BIGD in 1970 and projected to about 12 BIGD in 1985.

Next in significance are industrial water withdrawals (cooling water demands being the most prominent), estimated at 2.8 BIGD in 1970 and projected to 3.3 BIGD in 1985. Withdrawals by municipal water systems which serve about 80 per cent of Ontario's population were about 0.5 BIGD in 1970 and are projected to about 0.7 BIGD in 1985.

It is estimated that by the year 2000, the total water withdrawal (a composite of thermal generating station, industrial and municipal demands) will be in excess of 20 BIGD.

The potable water demands of a burgeoning urban-oriented population have often taxed the capacity of local aquifers and streams to their limit. The resulting need to obtain sufficient potable water has led to the construction of regional pipelines utilizing the Great Lakes as the source of supply.

There now exist, or are under construction, the Union (Essex County), Lake Erie (St. Thomas), Lambton (Sarnia), Blezard Valley (Sudbury), Lake Huron (London), and South Peel systems and active consideration and planning is being given to the development of several other systems as well.

Programs of the Ministry of the Environment provide for the quantitative measurement and recording of data on supplies of surface and ground waters. Permit systems provide for sharing of supplies where water is used for municipal and industrial purposes; all wells both bored and drilled, must be registered with the Province.

In order to contribute to the fund of knowledge available on global water resources, the Ministry of the Environment is participating in the International Hydrological Decade Program which spans the 1965-1974 period (53). The International Field Year for the Great Lakes, a unique water-balance study of Lake Ontario, involving the co-operation of many agencies in Canada and the United States will be concluded in 1974.

(b) Standards of Water Quality

Preservation of Ontario's water resource base is embodied in the Water Resources Act which provides for the protection, maintenance and upgrading of both water quality and quantity.

The Ministry of the Environment employs the following guidelines for control of water quality (53).

1. Standards which are established for water quality must be based on the best interests of the people of Ontario. These interests require the preservation, and restoration where necessary, of the quality of the Province's water for the greatest number of uses.

2. For each use of water there are certain water quality characteristics, identified as criteria, which should be met to ensure that the water is suitable for the use.

3. Following consultation with agencies or persons having an interest or responsibility in the present or future use of water in a basin, water quality standards will be established for waters of that basin, or parts thereof, consistent with important water uses.

4. Water of a quality higher than that required by the standards will be maintained at the high quality unless an alteration of the quality, consistent with the protection of all uses, is in the public interest.

5. There should be a constant effort to improve the quality of water, for it is recognized that the improvement of the quality of water makes it available for more uses. Requirements for wastewater effluents and land drainage based on the water quality standards will be established to ensure the maintenance of an acceptable quality of water.

6. In establishing effluent requirements from water quality standards a reserve capacity of the receiving water should be set aside to provide an adequate margin of protection in recognition of the limitations of water management theory and practice.

7. All wastes prior to discharge to any receiving watercourse must receive the best practicable treatment or control. Such treatment must be adequate to protect and, wherever possible, upgrade water quality in the face of population and industrial growth, urbanization and technological change.

(c) Water Quality Assessment Objectives

The objectives of Ontario's water quality assessment program are summarized as follows:

1. To determine and publish information on the water quality in the streams and lakes of the Province and to compare the quality with the criteria and standards of the Ministry of the Environment. In the Great Lakes, the water quality of the near shore waters, influenced by waste discharges and land drainage from land and water use activities in Ontario, is examined and compared with criteria and standards of the Ministry of the Environment and the water quality objectives of the Canada-United States Great Lakes Water Quality Agreement (53,57,58,75,87).

2. To identify pollution problems, including waste loading from municipal, industrial and other sources, and to define remedial or preventative control measures including effluent requirements to meet Ministry of the Environment standards and objectives of the Great Lakes Water Quality Agreement where applicable (53,71).

3. To assess the adequacy of existing water quality objectives or standards and, where necessary, recommend new objectives or standards for water quality (53,81,83,88,90,91).

4. To develop response models of receiving waters and, where required define mixing zones which describe the dispersion of pollutants, including the effects of varying quantities of waste discharge, and permit the determination of optimum locations of waste outfalls (53).

Since 1964, the Ministry of the Environment and its predecessor, the Ontario Water Resources Commission, have conducted extensive water quality monitoring and surveillance programs to gain information on compliance with water quality objectives and standards, and developing problems. Currently, some 650 inland water locations and an additional 2,000 stations on the Great Lakes and connecting channels are examined on a regular basis.

Related surveillance programs include aerial and vessel patrols of waste sources and locations of spills of oil and other hazardous materials. In recent years, a sediment-sampling program has been employed to determine the extent of contamination of lake and river beds by heavy metals such as mercury, lead and zinc and by organic and other inorganic waste materials.

In 1973, a joint study of water use, conservation and water quality problems in the Thames River basin was undertaken by the Ministries of Natural Resources and Environment to develop water-quality standards and needed water-control measures. Both Ministries, in co-operation with the Ontario Pesticides Laboratory (Agriculture and Food) have analyzed fish for DDT, dieldrin and mercury. In locations where mercury-contaminated fish have been identified, commercial fisheries have been closed and sports fishermen warned not to eat their catches. The Radiation Protection Laboratory of the Ministry of Health provides analyses of radioactive substances in water for the information of the Ministry of the Environment.

A phytoplankton inventory of the quality of the near-shore waters of the Great Lakes is maintained by the Ministry of the Environment. Samples are taken at water intakes and other locations and are used for quality control purposes at waterworks as well as for mapping the distribution and abundance of algae.

The use of pesticides and herbicides for the control of insects, and algae and aquatic plants, is rigidly controlled in Ontario. A permit system has been established to regulate the application of chemical agents to surface waters in the Province and has proved to be effective in minimizing pollutional effects of these chemical agents.

(d) Management of Water Supply and Waste

The environmental impact of any project, procedure, policy or legislation is a matter receiving the close attention of the Ministry of the Environment and the Resources Development Policy Field of the Government of Ontario. While this type of analysis of environmental and planning matters is presently confined to major project undertakings, a more formal analysis and review procedure is being considered for developmental and other projects, (15).

Currently, guidance is given municipalities located in rapidly developing areas of the Province in matters related to regional servicing of other utilities (9). All plans for water supply and distribution and waste collection and treatment are reviewed before construction. All operating water-supply and wastewater treatment facilities are inspected for compliance with Ministry objectives and standards. Efficiency of operating water utilities is promoted through operator-training courses (8).

The Ministry has extended its grant programs for construction of water and sewage facilities in municipalities to encourage provision of these services at reasonable cost (10).

Surveillance is conducted of industries discharging wastes to watercourses and municipal sewage systems. This involves the field inspection of industrial operations and treatment facilities employed by power generation facilities, basic iron and steel producers, petroleum and chemical complexes, food-processing plants, pulp and paper mills, mining and metallurgical operations, including sources of radioactivity. Surveillance programs for sources of radioactivity are developed in co-operation with the Atomic Energy Control Board and other interested federal and provincial agencies.

Evaluations are also made of proposed designs for industrial treatment works and an environmental impact-analysis procedure for major industrial undertakings, where these may be proposed, is being developed.

By the year 2000, significant increases in the rejection of waste heat from once-through, water-cooled electrical generating stations will be realized.

Shorewaters, which are particularly important to the ecosystem of an entire lake, may be altered in the vicinity of discharges of waste heat. Nevertheless, in certain areas the discharge of heated water can also provide beneficial effects by improving circulation patterns, and by increasing the recreational potential, if other pollutants are absent.

Reviews are made of proposals by Ontario Hydro for siting of generating stations to ensure adequate consideration of all environmental implications of site selection and station operation, and an environmental assessment is now required for all proposed thermal and nuclear power generating stations.

In order to minimize the adverse effects resulting from spills, a contingency program for combatting spills of oil and other hazardous materials has been implemented. Because spills can range in size, federal and international (Canada-United States) complementary contingency plans have been implemented in the event that an escalated response to an incident is necessary.

All proposals for dredging and marine construction in the waters of the Province are reviewed to determine whether or not the dredging techniques and the dredged spoils will be deleterious to water quality. The Province generally requires that dredge spoils be disposed of in specially selected areas or be disposed of on land if they contain excessive organic material.

Ontario enacted a regulation in 1966 which prohibits the discharge of polluting wastes from pleasure boats. A further regulation, which became effective in 1970, requires marinas and yacht clubs to provide or arrange pumpout service for outlets aboard customer pleasure craft. At present, regulations and requirements for commercial vessels have not been promulgated by the Federal Government (86) (92).

The inadequacy of private sewage disposal systems in unsewered areas is also a cause for concern. Ontario is actively working on projects which include the following: the feasibility of sewage-holding tanks; haulage and disposal systems in urban areas; phosphate removal by the addition of aluminum, calcium and iron oxides mixed with soil; and aerobic treatment systems for single-family dwellings.

(e) Effects of Land Use and Drainage on Water Quality

In addition to the land uses which lead to the production of waste and polluted drainage from communities and industries, other land-use activities exert recognizable effects on water quality.

Various crops require different levels of nitrogen, phosphorus, and potash for optimum growth. Producers are encouraged to take soil samples from individual areas, and submit the samples to the soil testing laboratory at the University of Guelph for analysis. Based on this analysis, fertilizer recommendations are made to producers. The economical and wise use of manure means that a decreasing amount of chemical fertilizers is being used.

Excess application of chemical fertilizers may have adverse environmental impact on soil and water and is a concern of the Ministry of the Environment.

Guidelines directed towards improved control of the use and disposal of waste sludges on soils have been proposed by the Province. These guidelines include recommended minimum distances from water supplies as well as acceptable rates of addition to crops.

Much debris and materials accumulate along highways and transportation arteries from road use (spills) and maintenance. These may be carried into drainage systems and then streams. Generally, relatively short-lived herbicides are used in the maintenance of public rights-of-way (highways and power transmission lines) in Ontario. The possibility of contamination of waterways is, therefore, minimal.

While litter-control programs are quite effective, scrapings from snow removal operations and washings from urban roads are known to contain a variety of substances including salts, pesticides, heavy metals, and other water pollutants.

The Ministry of the Environment has issued guidelines for the removal and disposal of snow from roads. Basically the direct dumping of snow into watercourses is discouraged except in emergencies. The Ministry works closely with municipalities to locate suitable land-disposal sites to ensure that dumping in the waters of Ontario is held to the minimum. Further, municipalities are urged to discourage excessive use of salt in road maintenance programs.

Guidelines have been established to cover land filling and other construction activities such as pipeline crossings or bridge crossings on inland waters and along the Ontario shoreline of the Great Lakes.

Streambank and shore erosion are influenced by many of these factors while substantial improvements in soil conservation have been made in Ontario.

The Ontario Legislature appointed, in June 1972, a Select Committee to examine, study and enquire into matters regarding land drainage in Ontario. The Interim Report of the Committee was tabled in the Legislature in December 1972 and dealt mainly with improving the administration of drainage matters in the Province. A second report is expected as this Legislative Committee proceeds with a broad examination of the land-drainage program in the Province.

As directed by the Legislature, the Committee expects that its future recommendations will lead to improved efficiency in agricultural production; the development of measures for resolving conflicts of interest, especially concerning protection of the environment, and the formulation of the necessary legislation.

(f) Restoration and Enhancement

Canada-United States Agreement on Great Lakes Water Quality

The Canada-United States Agreement on Great Lakes Water Quality of April 1972 (3,48, 51,55,60,61,72,100) provides for the implementation, by 1975, of the following: the completion of wastewater treatment facilities at all municipalities in the Great Lakes System; the construction and operation by industry of waste treatment facilities to meet the water quality objectives, and the control of phosphorous which may include reformulation of detergents and the installation of phosphorous removal facilities.

Also, measures are to be developed and implemented for the control of pollution from agricultural, forestry and other land-use activities; regulations are to be adopted controlling wastes from vessels, and control of dredging

activities; measures are also to be developed and implemented for the control of pollution from onshore and offshore facilities, including prevention of discharges of harmful quantities of oil and hazardous polluting substances.

Provision is made for the maintenance of the Joint Contingency Plan for dealing with oil and other hazardous and polluting spills, as well as consultation and further identification and definition of hazardous polluting substances.

The International Joint Commission was authorized to co-ordinate detailed studies of pollution of Lake Huron and Lake Superior and recommend measures to prevent further destruction of these lakes as well as ways to reduce water pollution from land drainage, forestry and agricultural sources. The agreement provides for the co-operation of research agencies (73) and the independent publication of reports by the International Joint Commission (2,73, 84,85).

Canada-Ontario Agreement on Great Lakes Water Quality

Concluded in August 197l in advance of the Canada-United States Agreement, the Canada-Ontario Agreement provides for support of the International Agreement, including the construction of municipal sewage treatment facilities on the Canadian side of the Lower Great Lakes Basin and the accelerated provision of phosphorous-removal facilities.

Under the Agreement, the government will provide monies for construction of municipal sewage treatment and phosphorous removal facilities as well as a joint research effort for improved waste treatment. In order to update the Canada-Ontario agreement, funds should be clearly earmarked for construction of sewage treatment facilities in the Upper Lakes Basin: other adjustments should be made in the Agreement to make it more consistent with the International Agreement.

Since the inception in August 1971, the Canada-Ontario Agreement has advanced research in the following areas: waste treatment, treatability studies for phosphorous removal, batch treatment of oxidation ponds for phosphorous control, sludge disposal, effluent polishing, spray irrigation of effluents and use of waste pickle liquor.

Conservation

The Conservation Authorities Act provides for the establishment of authorities to undertake projects in natural resource conservation by the initiative of local municipalities. Basic funding is shared equally between the municipalities and province through the Ministry of Natural Resources, which also provides technical guidance.

Nearly all of Southern Ontario has been organized into 35 watershed authorities. In Northern Ontario, where most of the land is still in public ownership, three authorities have been formed in response to local needs.

The primary work is water control by the construction of dams and reservoirs to prevent floods and store water during periods of high flow in the spring. The water will be released gradually during the summer to augment low natural flows for domestic, industrial and agricultural use and for the dilution of treated sewage effluents.

Regulations for flood plain mapping have been established for waterways throughout the province to prevent encroachment of buildings on flood plains. A flood forecasting and warning system (18) has been organized in co-operation with the federal government using data collected from an extensive network of weather and stream gauging stations.

The program also includes outdoor education in land management for forest tree planting, wildlife habitat improvement and recreational purposes.

(a) Soils and Agriculture

Concern for water pollution has led to co-operative programs with the Ministry of Agriculture and Food whereby farmers are encouraged to reduce run-off and loss of top soil from their lands by employing altered farming practices. Farmers have been shown by demonstration how to improve their own pastures and increase acreage of pasture lands. Mismanaged lands have been improved by grassed waterways and gully control works. Assistance is given in the establishment of farm windbreaks and shelterbelts.

(b) Fisheries

Most waters (impoundments and streams) under control of the conservation authorities provide some form of angling. With the growing interest in the establishment of sports fishing, which requires good quality water, many authorities are involved with stream habitat and water quality improvement projects. One authority operates a fish hatchery for stocking purposes, complementing similar programs undertaken by the Fish and Wildlife Branch.

(c) Wildlife

Conservation Authority lands, particularly those adjacent to impoundments and streams, provide wildlife habitat. Wildlife habitat improvement projects on some of these lands further promote programs for the maintenance of adequate, good quality water.

(d) Parks and Protected Areas

Most authority-owned lands are used for some form of recreation, with "Conservation Areas" providing facilities for picnicking, camping, swimming, boating, fishing, nature study and hiking. The maintenance of abundant, good quality water is necessary if these areas are to be useful to the public.

Where rivers flow through urban centres, it is the policy of some Conservation authorities to acquire all flood plain lands, undertake the necessary channelization work and then lease the flood plain to the municipality for development as park land.

Wet lands have been acquired and, in most cases, placed under agreement with the Ministry of Natural Resources for management. Where possible, unique and fragile sites are acquired to preserve their values.

(e) Erosion and Protection of the Great Lakes Coastlines

The damage caused by the high levels of water in the Great Lakes is a matter of considerable concern to the Government of Ontario. Important aspects of the problem involve the provision of assistance to the people affected, and the development of measures to avoid similar situations in the future.

Short-term aspects include: assistance by the Armed Forces upon threat to life; legislation authorizing loans and assistance in contingencies for repair work and recruitment of labour and facilities by the Province to assist municipalities. Ontario programs include improved dyking for agricultural lands. Further, discussion between the federal and provincial governments is being directed towards the possibility of constructing permanent systems of shore protection on the Great Lakes.

Lake and River Improvements

The Lakes and Rivers Improvement Act provides for the use of waters and regulation of improvements in the lakes and rivers of the Province, including efficient and safe maintenance and operation of regulatory works. The Act also provides for the use, management and perpetuation of fish, wildlife, and other natural resources dependent on such waters.

Some one thousand old dams in the Province have controlled water levels in lakes and head ponds for periods of 20 to 150 years or more. Shorelines of these lakes and head ponds have been developed for industrial, commercial and residential purposes. Wildlife and fish populations have become established — all of which have become dependent on the range of levels controlled by old dams.

Failure of these dams through improper choice of location or design, poor construction or maintenance, can cause flooding and erosion, property damage, and loss of life, fish production and recreational value. On the other hand, their beneficial effects can be flood control, low flow augmentation, power generation, creation of artificial impoundments for recreation, property enhancement and creation of wildlife habitat.

Pesticides Control

The legislative base for pesticide control is contained in the Pesticides Act and the Environmental Protection Act. In conjunction with the administration of this legislation, monitoring is done from a number of sampling points in the Province. Commodities sampled include milk, avian fat, porcine fat, beef fat, eggs, potable water and surface water.

The Pesticides Act provides for the licensing of all commercial applicators of pesticides as well as persons who apply herbicides and persistent organo-chlorine insecticides on their own premises or the premises of their employer.

Specific sections are included in the legislation prohibiting the washing of sprayers in rivers or other bodies of water unless the sprayer is equipped with an approved device to prevent back syphonage.

Where a pesticide is inadvertently dumped into surface water there is a provision that the Ministry of the Environment and the local medical officer of health must be notified immediately.

New regulations and licensing procedures designed to further tighten the control of pesticides, and to keep the more toxic of these substances out of the hands of non-professional people, came into force in the Province on January 1, 1973. Under these new provisions, retail outlets for the more toxic pesticides will be licensed, with the license indicating the class or category of pesticide that the outlet is permitted to sell and to whom the pesticide may be sold. The four categories of pesticides are as follows:

Class A - Restricted to licensed applicators or specific permit holders and having LD_{50} values of less than 50 mg/kg. (see footnote).

Class B - Restricted to licensed applicators and farmers, foresters and custom sprayers. LD_{50} values from 50 to 500 mg/kg.

Class C - Home and garden pesticides. LD_{50} values from 500 to 5,000 mg/kg.

LD_{50}-a dose or amount of pesticide which, when given by a specific route of administration, e.g. by mouth or left in contact with bare skin, will produce death in 50 percent of test animals. The dose is expressed in milligrams of pesticide per kilogram of test animal body weight (mg/kg.) as follows:

oral LD_{50}-oral route of administration

dermal LD_{50}-skin route of administration

parenteral LD_{50}-injection route of administration

Class D - Unrestricted - the next innocuous very low concentration products, aerosols etc.

Those pesticides which are on a restricted list will be available only on a specific-use permit and the outlet selling them will have to keep complete sales records. The new licensing rules will not only prevent the abuse of pesticides by inexperienced people but will ensure that these pesticides are channelled solely to those areas where they are vitally necessary.

Waste Management

Ontario's waste management programs may be separated into the following:

- municipal and industrial solid wastes;
- liquid industrial wastes;
- hazardous wastes;
- agricultural wastes and sewage sludge;
- abandoned automobiles
- litter

The objective is to provide guidance in reducing the amount of waste generated and to provide for reclamation of materials or energy.

(a) Municipal and Industrial Solid Wastes[16]

Since disposal sites have been generally located in the past without consideration of pollution problems, they are very frequently found adjacent to bodies of water which may be seriously contaminated as a result. Organic material, soluble salts, and alkali can cause degradation of water quality. Current control programs emphasize careful site selection and usually involve the conduct of sanitary landfill operations.

By 1980, a 50-percent increase in the quantity of solid waste produced over current levels will require increased use of land for disposal and developments in technology to displace present inadequate methods.

Ministry programs include the certification and inspection of disposal sites, transfer stations, incinerators, and collection and transport vehicles. Municipalities are assisted by the provision of grants covering 50 percent of the costs of related planning studies. In addition, a program of loans to municipalities is being initiated to assist them in developing adequate waste handling and disposal systems (10).

Various alternatives are being studied for recycling solid waste into fuel to be used for generating electricity, thus cutting down energy costs and storage problems. If programs currently under study prove successful, it is estimated that perhaps garbage could replace 10 to 20 percent of coal now being used to generate power.

An experimental reclamation plant is being considered as the first stage in the development of a Solid Waste Resource Centre. The objectives of the Resource Centre will be to test the various technologies available for the separation of components of waste, the processing necessary for their re-use and the development of reclamation technology for municipal use.

To help reduce the amount of waste generated and to encourage re-use and reclamation, the Ontario Government has set up a Solid Waste Task Force to examine trends in packaging, merchandising and consumer habits, alternate waste management systems, possible uses for reclaimed material, and existing legislation.

The re-use of packages and containers should be encouraged and those not re-usable might be re-designed with their eventual disposal in mind. Consideration might be given to the imposition of special taxes on wastes which do not lend themselves economically to re-use or reclamation.

(b) Liquid Industrial Waste

Bulk liquid industrial wastes [17]require special handling as disposal on land is often undesirable.[18] Using economies of scale, two central treatment facilities have been established serving the Toronto-centered region to handle this expensive type of operation for a large number of industries. When fully operational, these facilities will include three treatment stages, thermal decomposition (operational), chemical and physical processing and biological oxidation. Resulting sludges may be incinerated or landfilled.

A major problem arises from various processes which result in very large quantities of dilute soluble salts. A good example is the brine displaced from underground gas and other storage caverns. In areas where deep well disposal

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[16] *Municipal and industrial solid waste collected under the control of Ontario municipalities amounted to 8 million tons in 1970 and is projected to increase to 12 million tons by 1980. Waste of this type is comprised, on the average, of about 50 percent paper and paper products, 15-20 percent organic waste or garbage, 5-10 percent metals, 5-10 percent glass, 5-10 percent ashes, and the remainder miscellaneous substances. Disposal of this solid waste has been undertaken at 4,000 dumps (3.3 million tons) and 500 sanitary landfill sites (4.5 million tons), with the remainder undergoing incineration. The average annual collection and disposal cost of municipal and industrial waste is estimated at $8 - $10 per capita. If present collection and disposal methods continue, waste volumes increase, and standards are rigidly enforced, the 1980 costs would be at least $25 per capita per year.*

[17] *Liquid industrial wastes include brines, cutting oils, caustic cleaners, pickling acids, chromic acid dips, etc. In general, with the exception of brine, these industrial liquids are concentrated batch wastes which are hauled away by truck to landfill sites for disposal. Brine wastewater, arising out of gas and oil well operation, is by far the most significant industrial liquid in terms of volume. Deep well disposal in suitable underground formations serves as the method of disposal for this waste.*

[18] *In 1970 about 140 million gallons were disposed of in landfill sites and 160 million gallons in deep wells.*

of waste can be justified as a reasonable interim solution, the policy is to permit this activity only if formations of possible economic value are not impaired. Generally, the approach is to discourage deep well disposal in favour of waste reduction and surface treatment.

(c) Hazardous Waste

Generally, waste which includes fire hazards, explosives, poisons, radioactive substances, pharmaceutical and pathological materials, is well handled as producers of these wastes are well aware of the risks involved[19]. An early warning system is being developed to provide an alert to all potential hazards so that plans for handling and disposal can be made in advance (20) (71).

(d) Agricultural Waste and Sewage Sludge

Large quantities of manure from cattle feedlots, piggeries and confinement operations for egg production are significant sources of waste which contribute to public health and water quality problems if not properly handled[20]. Farmers are given advice on land requirements for the utilization of liquid manure in crop production through the Ministry of Agriculture and Food, in co-operation with the Ministry of the Environment.

A suggested code of practice prepared jointly by the Ministries of Agriculture and Food and Environment has been published to guide construction of livestock buildings and disposal of animal wastes.

In co-operation with other ministries, an examination has been made of the disposal of sewage sludge onto agricultural land and regulations have been developed for handling and disposal (20, 22, 71, 78). This matter is of particular concern as phosphate removal programs become advanced at sewage treatment plants in Ontario.

The objective is to determine maximum rates of sludge application to agricultural soils without polluting ground and surface waters with plant nutrients, heavy metals, or pathogens and without reducing the quantity or quality of the crops produced.

(e) Abandoned Automobiles

In July 1973, the Derelict Motor Vehicle Regulation controlling private and commercial accumulations of junked automobiles became effective. Waste management sites will require certification based on approval of sites and systems. The eventual objective is the development of organized transportation and marketing systems for recycling and reclamation for metal supplies.

Noise

The Ministry intends to regulate noise from vehicles, stationary sources and recreational devices (snowmobiles) in addition to establishing provincial ambient noise criteria and land-use policies. (14) Proposed control programs include the establishment of overall noise levels for different types of industrial, residential and rural areas and the drafting of a model noise by-law for municipalities that can be more easily enforced than present ones.

Framework for Action in Ontario

DISTRIBUTION OF CONSUMPTION AND REDUCTION OF WASTE

In formulating an appropriate Framework for Action in Ontario, consideration should be given, first of all, to what was undoubtedly one of the pivotal issues at the United Nations Conference on the Human Environment, namely, the inequitable distribution of consumption of resources between the economically-developed parts of the world and the economically-developing parts.

The per capita product of the more-developed countries exceeded that of the less-developed by about twelve times in 1965 and is expected to increase to a factor of eighteen times in the year 2000.[21] Viewed from the consumption of energy and major resources, other estimates indicate that each Canadian citizen in his lifetime consumes up to 30 times the energy and major resources consumed by a person living in an area of the world which is yet economically underdeveloped (and the disproportion is even greater in the case of the United States).[22]

When it is realized that much consumption is waste, it becomes clear that this problem must be solved. The momentum of consumption inflated by waste must be retarded.

At the same time, the developed nations have been called upon to maintain their economic strengths and the flow of assistance to developing countries, augmented to meet their environmental requirements. Encouragement should be given toward the correction of imbalances created by concentrations of population and the consumption of resources rather than toward unlimited economic expansion.

Ontario, one of the more highly developed economic regions of this country has, therefore, a particular responsibility in this vital area.

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[19] *About 0.5 million tons were disposed of by landfill in 1970 and the quantity is projected to increase to 2 million tons by 1980. Despite the substantial hazard associated with such materials, there have been few incidents resulting in injury.*

[20] *In 1970 about 10 million tons of agricultural waste and sewage sludge were disposed of on land. This figure is expected to increase to more than 25 million tons by 1980.*

[21] *MacNeil, J. W. 1971, Environmental Management, Information Canada, 191 pp.*

[22] *The Growth of Limits, F.H. Knelman, 20th Ontario Industries Waste Conference, Toronto, Ontario. June 23-26, 1973.*

ENVIRONMENTAL ASSESSMENT

A growing awareness has developed in Ontario toward the better utilization of energy, mineral and renewable resources. Emphasis is now being placed on the environmental assessment of development projects and this approach is expected to be expanded.

The environmental consequences of alternative courses of action should include an evaluation of the actual need for the project. The ongoing operations of the project should be audited to ensure the environment is adequately protected.

Planning for major projects would incorporate consideration of the effects on the environment of various levels of resource use as well as the effects upon climate. As well, provision should be made for review of legislation.

AIR AND WATER QUALITY CRITERIA

The Province should continue to develop criteria from which objectives or standards can be established for air and water quality. In this connection, sound scientific information should be employed concerning the carrying capacity of the environment with respect to the various effluents and emissions resulting from human activities, including noise.

These criteria, objectives or standards should, in turn, continue to be used in the development of control programs and other measures for achieving and improving the quality of the environment.

MONITORING OF AMBIENT AIR AND WATER QUALITY

In recognition of the need for before-and-after information on the predicted and actual performance of the environment under stress, programs for monitoring ambient air and water quality conditions should be strengthened. The program should be expanded to include wildlife species as indicators of general environmental quality.

Such monitoring would be in keeping with the responsibility of the Provinces to undertake surveillance of the characteristics of effluents and emissions, including their impacts on surrounding ambient quality, with a view to determining the degree of compliance with effluent and emission requirements and ambient quality objectives or standards.

As the global system of monitoring pollutants is developed, the Province should participate by making data from its extensive environmental monitoring networks available for the Earthwatch program.

REMOTE SENSING

Remote-sensing programs, including coordination and interpretation of data, should be interrelated with federal programs, through provincial remote-sensing interpretation centres, in order to facilitate the application of this technology to the evaluation of pollutants and in the survey of resources.

HAZARDOUS PRODUCTS AND SUBSTANCES

The designation by legislation of environmental contaminants, to control or prevent the manufacture, sale and distribution of products hazardous to human health and the environment is under development in Canada.

In framing this legislation care will have to be taken to avoid inclusion of products hazardous to health but with no known environmental hazards, e.g. certain drugs and medications. Close involvement of the provinces is required in the development of this legislation, and supporting Provincial legislation will likely be required as the Federal guideline legislation is developed.

A catalogue should be compiled from private, governmental and other sources, of hazardous polluting agents entering or about to enter the environment. Where provincial legislation may be needed to require the provision of this information, consideration should be given to its early enactment.

The proposed legislation will require expanded programs of research both by government and the private sector to strengthen the knowledge of the pathways and the effects of contaminants. The main thrust of fundamental research into environmentally hazardous contaminants should be provided by the Federal Government with the provinces responsible for implementing control programs on the quantity of hazardous pollutants released into the environment.

Activities designed to provide the maximum preventive capability relating to spills or accidents involving hazardous materials should include:

i) the adoption of regulations establishing standards of performance for the facilities used to manufacture, store, and transport hazardous materials,

ii) the establishment of siting criteria, consistent with land-use planning policy, for locating "high-risk" manufacturing and storage facilities, and

iii) the adoption of regulations regarding acceptable routing for transport of various quantities of hazardous materials by the different modes of transportation.

The Federal Government should provide guidance in the implementation of regulations for interprovincial and international transport.

While contingency plans are available or under development to enable response to incidents respecting spills or losses of hazardous pollutants, greater emphasis should be placed upon prevention to avoid damage which may result to health or property as a result of a spill or incident.

RENEWABLE RESOURCE CONSERVATION AND LAND INVENTORY

In strengthening programs to protect and preserve renewable resources, efforts should be devoted to carrying out complete ecological inventories of lands before planning for new land use or before any form of resource extraction or utilization is undertaken. The inventory should include: the state, quality and limitation of soil; existing habitats; marginal lands and forest cover; existing uses; demand and supply for recreation; waste production and indices of environmental quality.

The inventory should form an input to the provincial and regional planning process carried out in connection with the implementation of the Ontario Planning and Development Act. The inventory should be integrated with the Province's computerized central inventory of residential, recreation, farm, commercial, industrial, vacant land and special purpose properties being developed for property assessment.

CONSERVATION OF FOOD-PRODUCING LAND

The population of Ontario is growing rapidly, and with the increase is a sharply increased demand for food supplies. The people of this province have enjoyed an abundant supply of safe wholesome food to the extent that its availability is accepted as a matter of course.

But Ontario is a net importer of food. The present world food shortage, increasing competition for land for purposes other than food production, and the increase in population suggest that Ontario can no longer take for granted the availability of an abundant supply of food for its population.

The Province's position is that land suitable for food production should remain available for food production wherever possible.

Current policy is to encourage increased food production on every available acre of farmland. Policies are being developed to encourage the continuance of food production on land assembled for future urban development.

ENERGY

Energy is essential for the utilization of most resources, and its importance is fundamental. The Ontario Government has recognized this in the recent formation of the Ministry of Energy. It is accepted that all proposed energy projects involving the use of oil, gas, coal, uranium, hydro power, and other alternative energy sources (including production, conversion, transportation, transmission and use) should not be permitted to proceed until the impact on the environment among other social concerns is proven to be acceptable.

In relation to radioactivity and other hazardous substances the Province has adopted the following principles:

(i) rates of release of radioactive wastes into the atmospheric and aquatic environment from all operations should be kept to the lowest possible level.

(ii) all release levels of radioactivity should be carefully reviewed periodically and revised so that the build-up of longlived radioactivity in the environment will not unwittingly become a legacy for future generations.

(iii) contingency plans, to protect public health and safety in the event of a catastrophe at a nuclear facility or heavy water production plant (possible loss of hydrogen sulphide), should be developed and periodically reviewed as population patterns change.

WASTE HEAT

The utilization of energy from burning garbage and waste heat from power generating stations should receive full consideration in planning the development of energy-generation facilities. In areas where harmful effects of the discharge of waste heat from electrical generating stations can be predicted, adequate cooling facilities should be employed.

In those instances where potential hazardous effects may exist but cannot be clearly predicted, designs for power plants should be flexible in order to provide for the addition of cooling capacities as these may be required to offset cumulative adverse effects in the future. Cooling water discharges should not alter existing circulation patterns to the extent that water uses are seriously depreciated, or spawning and fishing areas are adversely affected.

CONSERVATION OF ENERGY

As effective conservation of energy will lead to efficiency in use and reduction in the impact on the environment, policies reflecting wise use of the available forms of energy and reduction of unnecessary consumption of energy should be pursued by the Government of Ontario. The Province should further encourage:

- improved use of air, land and water transportation systems to conserve energy.
- intensification of efforts to provide highly efficient mass transportation systems in urban centres, thereby reducing automotive pollutants and conserving energy.
- development of stricter insulation standards for all new residential and commercial buildings. Such standards would serve to conserve energy and would assist in reducing the deterioration of air quality. They should be implemented as soon as possible.
- the use of more efficient types of combustion systems of lower pollution potential in developing residential and commercial buildings.

EXCHANGE OF INFORMATION ON IMPACT OF ENERGY TECHNOLOGY

As increases in knowledge, including more specific information concerning the environmental effects of energy technology and its use, are accumulated through environmental monitoring programs, this information should be published for exchange with other governments and international agencies.

MINING AND MINERAL PROCESSING

Wise use and conservation of finite resources should guide mining and mineral-processing activities to obtain the greatest gain for the Canadian people. Industrial goals for the processing of non-renewable resources to manufactured articles should provide for the greatest economic return with the minimal impact on the environment. These activities should be subject to suitable performance standards, including systematic audits, to keep disturbance of the surrounding environment to a minimum.

Legislation dealing with stabilization of mine-tailing areas by vegetation or other methods should be extended to include abandoned areas as well as treatment of seepage and runoff. Stabilization and maintenance of abandoned tailings areas, where the need has been established for each area, should be undertaken to secure, in perpetuity, their containment, including isolation and cover, and erosion control.

Treatment of seepage and runoff should be provided by the mining companies or by the successors of these companies who are responsible for the disposal sites. The use of lake basins for containment of tailings at new mining locations should be discouraged.

Rehabilitation procedures required by existing legislation should follow closely mining operation in sequence. Spill piles should be contoured and revegetated as mining progresses.

FARM MANAGEMENT PRACTICES

Farm management practices, involving food production and processing, and use of fertilizers, animal wastes, pesticides, etc., should be conducted in a manner which exerts a minimal impact on the environment while contributing to the viability of farming and other sectors of the agricultural and food industry, as well as to the social and economic well-being of people, including the farming community.

Modification of existing cropping and land clearing practices and restriction of livestock access to watercourses should be actively pursued where required, to prevent unnecessary wildlife losses and control erosion and water quality impairment.

RECYCLING OF WASTES

The federal and provincial governments have undertaken limited research into the control and recycling of wastes in agriculture through the Canada-Ontario Agreement on Great Lakes Water Quality and the utilization of combinations of animal wastes and municipal solid wastes. Increased efforts and emphasis should be given to solving the problems related to such wastes, especially with respect to utilization of agricultural wastes by commercial farming enterprises.

FOREST MANAGEMENT

Forests in Ontario are in an early stage of transition to regulated forests. During the past twenty years the forest manager has been preoccupied, primarily, with planning and organization to obtain the best forest production. Only recently have the demands of industrial and environmental forestry become competitive.

Forests must now be managed for a multiplicity of purposes to achieve the greatest total net benefit to society. Important objectives to be considered in the development and maintenance of forestry resources include:

- identification of those land areas required to meet govenment objectives for wood production and incorporation of these into broad land-use plans. Full consideration should be given to many factors often not quantified, involving aesthetics, preservation, conservation, and environmental protection.
- encouragement toward the reservation of as much land as possible against future options, particularly in areas where the traditional lifestyles of native peoples are threatened by resource development, and where the biological productivity of land is problematical.
- identification and reservation for detailed evaluation of forest areas that appear to have unique values and characteristics that equal or surpass the value of the estimated wood volumes.
- modification, where necessary, of forest harvesting by delineation of protection forests (sensitive sites) and those with aesthetic and recreational values. Cuts should also be modified to encourage natural regeneration and improve wildlife habitat.
- increased production of silvicultural programs over the next ten years to ensure a future annual supply consistent with the government production target for industrial wood.
- provision of healthy forests and trees for other desirable programs to produce varied recreational opportunities and to improve the quality of man's environment.
- stimulation of utilization of the allowable cut by industrial expansion; improved use of preferred species, and development of markets for un-utilized species.
- improvement of the competitive position of the forest industry by rationalizing the supply and utilizing raw materials including utilization of residues.
- protection of the forest against fire, insect and disease by using modern technology with due

regard for environmental safety. As well, an organization should be formed to make aircraft, water bombers, and crop sprayers available for forest fire and pest control on an international basis.

- improvement of knowledge and application of varied silvicultural techniques, development of specialized equipment and evaluation of available chemical and biological controls directed towards carrying out regeneration and an optimum level of tending (culture).
- increased genetic research in major species, expanded seed production areas and seed orchards, and increased production of genetically improved stock and hybrid poplar.
- evaluation of completed management science studies to develop a long-range stock production and distribution system to meet silvicultural objectives.
- encouragement of the establishment and management of forests on private lands and creation of a public understanding of forestry so there will be an acceptance of forest management practices.
- participation, upon request, in assistance to developing nations by providing on-going training for their staff as well as contribution to international assignments.

FISHERIES AND WILDLIFE

In recognition of the importance of fisheries to the welfare of the people of Ontario and Canada, key elements of the fisheries program in Ontario should include the following:

- identification of the Province's needs to establish fisheries and wildlife objectives;
- an inventory of fish and wildlife resources, and identification of unique ecosystems and fragile areas;
- development of research and management programs for fisheries and wildlife to meet Ontario's needs and provide assistance to developing nations.
- further development of the educational program on resources management for the people of Ontario and assistance to developing nations.

The need is indicated for intensification of research in areas of selective breeding of fish in hatcheries, using preferred genetic stocks; the restructuring of fish communities; the development of methods of introduction of new species and their exploitation.

Considerable effort has been devoted to the restoration and enhancement of the water quality of the Great Lakes, and increased emphasis should be placed on improving the management and research of fisheries, including support for the Great Lakes Fisheries Commission.

There is a need to understand genetic strains of such species as Canada geese since overharvesting could lead to extinction. Unless controlled, importation of mammals and birds may lead to dilution of locally-adapted gene pools.

GENETIC POOLS

While much is being done in Ontario to maintain active genetic pools, as part of the world collection of grains, legumes and grasses, breeding stocks in soys and livestock (dairy, beef and swine) through co-operation with other countries, the emphasis has been on the maintenance of the most economic breeds in genetic pools.

In forestry, emphasis has been placed on the establishment of seed production areas. Increasing importance is being given to gene conservation and gene banks and the maintenance of a broad genetic base characteristic of natural and representative ecosystems. In recognizing that wildlife species may be threatened (i.e. depleted or made extinct) by man's development, renewed attention should be given to efforts of the International Union for Conservation of Nature and Natural Resources.

Locally-adapted gene pools should be protected by control of importation of wildlife from other areas. More broadly-based conventions on the protection of endangered species may lack precision in addressing local management needs.

As a first step in encouraging world-wide genetic conservation of threatened species, a registry or inventory identifying breeding and experimental projects related to primitive plants, micro-organisms, animals and aquatic organisms should be co-ordinated by the Secretary-General of the United Nations.

VESSEL WASTE DISCHARGES

The United Nations recommendations regarding acceptance and implementation of available instruments for the control of sources of marine pollution and compliance by the shipping industry require early promulgation of compatible regulations for the control of vessel waste discharges.

This is especially pressing in the light of commitments made by Canada in the implementation of the Great Lakes Water Quality Agreement. Initially, these regulations should deal with control of vessel sewage and provision of facilities for the safe and sanitary removal of wastes from all vessels.

Other requirements, involving the improvement of vessel design, construction and operation, should provide for control of discharges of harmful quantities of oil and hazardous polluting substances, the safe and efficient handling of all shipboard-generated wastes and their subsequent disposal, and the surveillance and enforcement of regulations dealing with the abatement and control of pollution from shipping activities.

STABILIZATION OF MARGINAL LANDS AND CONTROL OF EROSION

Encroachment of urban development and agricultural and recreational lands on wildlife habitat and shorelands are problems that should be addressed by the development of a more integrated governmental policy on the use and conservation of marginal lands. Of current concern are problems associated with high water levels in the Great Lakes and related damage to shore properties.

An evaluation should be undertaken of the extent of erosion from a variety of land-use practices, and where remedial measures are required the costs of modifying these practices should be determined.

NATURE RESERVES

There is a pressing need to expedite the establishment of nature reserve systems before more ecosystems are lost through failure to designate such areas sufficiently early. The same urgent necessity exists with respect to the designation of historic sites, historic buildings and archaeological sites within the Province.

Even before any form of conservation or development of these sites takes place, every effort should be made by the Province to obtain the largest possible land units associated with the sites.

MAN AND THE BIOSPHERE PROGRAM

It will be advantageous for the Province to work closely with the Man and the Biosphere Program (MAB) by contributing to the Canadian Committee's work on national research which is directed towards the solution of environmental and natural resource problems.

Chapter 2
THE QUALITY OF LIFE

Ontario View of Principles

The United Nations declares that man has the fundamental right to freedom, equality, and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being.

But it seems that as we in Ontario acquire more and more material products of the technological age in which we live, the quality of those products gets cheaper and cheaper to the point that they can be used but once before being discarded. And as the quality of the objects which fill our lives deteriorates, our appreciation deteriorates, and the quality of our lives deteriorates.

It is interesting that we have a mathematical figure which represents the value of all the goods and services produced in this great land of ours, a mathematical figure called the Gross National Product, or GNP. And it is interesting to note and not hard to demonstrate that as the GNP grows, the quality of life deteriorates.

All our lives seem to be devoted to the building of increments to the GNP — of increasing the Gross National Product as if it really were, as many people have come to believe, the keeper of the mythical land of milk and honey — the land of abundance where all desires may be filled because there is enough for everyone.

So we serve the mythical GNP, and the number of our home appliances grows, the number of our automobiles grows, the number of our televisions and radios grows, and the number of divorces grows, the number of juvenile delinquents grows, the number of crimes in high places and low places grows, and the quality of our lives depreciates as the quality of goods and services depreciates — as the Gross National Product grows.

A new ethic is needed — a new approach to the human environment, an approach based on the reasonable use of resources, and the conservation and renewal of resources, rather than the wastage of plenty — rather than polluted earth, smelly air and dirty water. And a new national product figure is needed — a figure which would be a measure of progress toward the achievement of "man's fundamental right to freedom, equality, and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being."

Such an index would be a measure of those intangible human benefits accruing to the individuals who are the people of Ontario, the people of Canada, from an enlightened society led by an enlightened government striving to achieve a new balance between man and nature, and between man and man, and a higher quality of life for all mankind.

Beyond basic concerns for survival, the quality of an individual's life will be influenced by the extent to which environment contributes to his health and well-being, efficiency of performance, comfort, pleasure and joy. Preoccupation with the need for accelerated economic development to eradicate disease, hunger and poverty, may result in less developed nations foregoing control of pollution. Meanwhile, the more developed nations are devoting increasing energies to restoration and enhancement of natural and man-made environments.

If the principles enunciated by the UN Conference on the Human Environment were heeded, there would be no need for concern about the environment. Principle 8 declares that the quality of man's life and its improvement, is predicated upon proper economic and social development.

Quote, "Economic and social development is essential for ensuring a favourable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life."

Principle 9 specifically cites the need to provide developing nations with substantial financial and technical assistance to promote economic and social development in the face of grave deficiencies caused by underdevelopment and natural disasters.

Quote, "Environmental deficiencies generated by the conditions of underdevelopment and natural disasters pose grave problems and can best be remedied by accelerated development through the transfer of substantial quantities of financial and technological assistance as a supplement to the domestic effort of the developing countries and such timely assistance as may be required."

The spirit and thrust of these principles are meaningful also for the economically and socially underdeveloped and underprivileged areas of Ontario and Canada.

Summary of U.N. Recommendations

The eight recommendations primarily related to the quality of life refer to the general areas of improving opportunities for people and upgrading programs and institutions. Recommendations 6 and 7 encourage improvement in the ability of persons to plan and manage human settlements as well as heightening their environmental awareness and capability. Recommendations 11 and 12 deal with population concerns, family planning programs and research into human reproduction.

Recommendations 62, 76, 81, 98 and 101 deal with program improvement. For instance, recommendations 76 and 81 urge that a monitoring sys-

tem and guidelines for substances dangerous to human health be developed as well as standards for pollution.

Recommendations 62 and 98 promote the conservation of natural resources and a study to relate their distribution to people's welfare. In the area of institutions, recommendations 76 and 101 seek to establish an international library service and a co-ordinating role for the World Health Organization.

Recommendation 109 is rather broad and is designed to ensure that strategies arising from Conference recommendations are properly integrated into existing aid programs. However, it does recognize that preoccupation of developed countries with their own environmental problems should not affect the flow of assistance to developing countries, and that the flow should be adequate to meet the additional environmental requirements of such countries.

Other recommendations arising from the Conference which have a bearing on the quality of man's life concern housing, utilities, health care, noise control, transportation and communications, employment and recreation, education and municipal organization.

Implications for Ontario

THE GLOBAL SETTING

While population size determines the impact on natural resources, its influence varies. Little economic and environmental progress will be made in the less developed countries if the rate of development is offset by excessive rates of growth of population; for a developed nation where per capita consumption of resources is high, population growth exerts a greater relative impact on natural resources and, at least to the extent degradation occurs, detracts from the quality of life. As these forces continue to act on the nations of the world, the disparity between the developed and undeveloped parts will be further exaggerated.

In addition to encouraging a more orderly utilization of domestic resources including reduction of waste, the governments in Canada should address the basic problems of concentrations of population and encourage development of densities more suited to overall social well-being. While the provincial and federal governments are involved in related family planning programs in addition to voluntary agencies, the whole area is fraught with problems largely social, political and religious. Political action is needed to endorse family and related population planning programs.

As a highly favoured province of Canada, Ontario bears a great responsibility in influencing this nation's international contribution to those areas of the world aspiring to achieve the basic amenities of life. Economic, technological and other assistance is being devoted to external needs today through agencies of the Government of Canada. These efforts must be strengthened however, to provide for participation of the provinces in determining the balance of future external and internal assistance.

The physical, mental, and social effects created by living and working in human settlements, particularly urban complexes, may enhance or detract from the quality of an individual's life. It is in the urban setting, sociologists maintain, more of the human needs can be satisfied. On the other hand, adverse stresses arise from people living too close together. It is, therefore imperative as populations continue to move into urban environments that the energies and resources of governments be given over to the planning and management of the living, working and recreational activities which make economic use of accommodation, energy, transportation and other community facilities. Employment is a factor which determines the food, housing, cultural and recreational aspects which, among others, contribute to the quality of life. Sustaining and maintaining sufficient meaningful employment is therefore a closely related problem.

Planning and management of urban and rural settlements, a major consideration of the Stockholm Conference, is of central importance to Ontario; it is an area which is increasingly attracting the attention of all levels of government in Canada.

URBANIZATION

The population of Ontario is close to eight million persons and it is estimated will approach 13 million by the year 2000.[23] By comparison, MacNeill (1971) has estimated that the population of Canada will become 32 million by 2000. With a provincial land area of 363,282 square miles, population density, in general, does not appear to be an acute problem.

From a local viewpoint, however, each community can be said to have a "critical mass" i.e. an optimum size in terms of population density, residential single-family and apartment dwelling mix, industrial development, recreational facilities, etc. Once the "critical mass" is exceeded, breakdown occurs because of all kinds of environmental problems.

Unfortunately, such optimal population and development densities have not yet been fully defined. There is a pressing need to conduct further studies in this area so that the environment and the associated quality of life will not deteriorate but will rather be directed toward the social well-being of the greater community (1).

The Province's overall population and economy have grown in recent years at almost unprecedented rates, and certain regional problems have emerged. In the northern and eastern areas of Ontario, problems involving slow growth and loss of population have occurred, whereas in the southern areas, especially the urbanized corridor along Lake Ontario from Hamilton to Oshawa, challenges associated with fast growth and

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[23] *MacNeill, J.W. 1971, Environmental Management, Information Canada, 191 pp.*

rapid change have risen. The potential spread and pattern of development of urban areas are matters of concern since there is an absolute limit to the amount of good agricultural and recreational land available.

Further problems arise from the rapid expansion of spatial demands for recreational and leisure activities. For instance, snowmobiling requires extensive land areas just as recreational boating requires water. Other land demands associated with urbanization involve roads and highways, electric transmission lines, pipelines, rail and air transportation facilities.

To meet the challenges posed, the Province's Design for Development program (1) has been devised to provide a framework within which the entire set of decisions made by all levels of government and the private sector can be coordinated. Three fundamental principles guide this program:

- The Government of Ontario accepts the responsibility of guiding, encouraging, and assisting the orderly and rational development of the Province.
- The Government's efforts should encourage private enterprise to prosper within a healthy and balanced community environment.
- The policies developed should be cast in the mould of Ontario's conditions and not just borrowed from other jurisdictions where fundamental characteristics and institutions differ.

The Design for Development program can be considered an umbrella program under which a multitude of inter-related social and economic problems such as housing, traffic circulation, recreational access, and pollution can be addressed.

Under this program broad regional strategies will be developed and refined through detailed plans prepared by regional and local governments. To date, intensive research has been done to inventorize existing conditions and document some of the problems in each of the five economic planning regions.

In the Northwestern Region a development program has been recommended, and growth strategies for the Northeastern Region are in preparation. The most advanced refinement is within the 90-mile arc surrounding Metropolitan Toronto in Ontario's Central Region.

It is in this Toronto-Centred Region that population distributions have been published and investigations into land-use controls for the Niagara Escarpment and Parkway Belt corridor systems have been undertaken.

In a recent report, the Ontario Economic Council recommends that the Province assign to municipalities development control power as a replacement for zoning and site-plan agreements in municipal areas designated for growth or change.

"This control would consist of a statutory freeze on all development (broadly defined to include demolition, the alteration of natural features, tree removal, and building construction and alteration) with development permission granted by council only after a case-by-case consideration of proposals." [24]

Further, in administration of zoning, the Council recommends that where municipal planning capability has been demonstrated, municipal councils should be allowed to approve zoning by-laws and amendments without the confirmation of any provincial agency.

It is through such programs that initial efforts are being made to produce comprehensive plans which, in the long term, should designate land for urban, industrial, recreational, and agricultural uses. Such plans, when implemented, will make possible the enhancement of man's living conditions.

MUNICIPAL ORGANIZATION

Because a number of municipalities in the Province are unable to meet the challenge of providing basic local services, reform of local government structure and the municipal tax base, and the system of grants to municipalities, has been initiated.

The local government reform program has three fundamental components; regional government, municipal consolidation, and the strengthening of the elected municipal council. By restructuring local government, it is hoped to create a strong system of regional governments which will be better equipped to carry out the broad policy strategies enunciated by the Province.

In addition, regional government will enable the people of a common area to pool financial and administrative resources so they can equitably share the costs as well as the benefits of services.

As a result of this program the Regional Municipalities of York, Waterloo, Niagara, Ottawa-Carlton, Sudbury, and the District Municipality of Muskoka have been formed. Proposals for regional government have also been presented for Wentworth, Halton, Peel, and the area east of Metropolitan Toronto.

In areas where regional government is not required, the existing municipal system is being strengthened by the consolidation of small municipalities into larger more viable units. In addition, selected locations throughout the Province have been sited as potential growth centres such as the new City of Nanticoke. Examples of consolidation are the new cities of Thunder Bay and Timmins.

More authority and responsibility is being shifted to elected municipal councils from various local boards and commissions which have been added to the municipal structure over the

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[24] *Report "Subject to Approval - A Review of Municipal Planning in Ontario" - Ontario Economic Council, 1973.*

years. The Ontario Economic Council has recommended the assignment of plan-making authority directly to municipal councils and the phasing-out of planning boards. Amendments to the Planning Act were recommended to phase-out committees of adjustment and land division, with authority being transferred to municipal councils.

These aspects of the municipal reform program should result in increased decision-making power on the part of elected municipal councils.

Further pertinent recommendations of the Ontario Economic Council concern urban renewal and technical improvements to guide municipalities. Revival of provincial participation in central business district schemes on a 50/50 cost-sharing basis for planning and implementation and of similar assistance in rural and resort area renewal schemes are recommended.

The Province is also urged to prepare manuals to guide plan-making, development control, zoning, urban renewal, subdivision control and plan implementation, as well as provincial grants for preparation of municipal plans, amendments or studies.

The Provincial Government has recognized that local governments are hampered and frustrated in reaching their full operating capacity by a serious inadequacy of income.

Ontario has, therefore, taken the initial step toward local taxation reform by having all real properties in the Province assessed at market value to establish a uniform, equitable, and consistent local tax base. Valuation techniques are being implemented to cope with the turbulence of real estate markets with the object of concluding tax reform for local taxation purposes by 1977.

Once the whole Province has been assessed, the Government will be in a better position to develop and complete three main areas of local taxation reform. The first area is the broadening of the real property tax base by the removal of exemptions from taxation. For instance, mineral processing plants have already been removed from the tax-exempt class.

Municipalities can also levy a tax, not exceeding $25 per student, on provincially-assisted universities in lieu of property taxes. The feasibility of subjecting other institutions to municipal taxation is also being considered.

The second area of reform concerns the achievement of a more neutral business tax on commercial and industrial properties. The third area involves the distribution of taxes among classes of real properties. These areas are interrelated since the rate of business tax has a direct bearing on the taxation of all other classes of property.

The whole area of local taxation reform is most important. Municipalities raise more than $1.5 billion a year in property taxes. This figure represents about one-half of their total revenue. The other half comes from the Provincial Government in the form of transfer payments and conditional grants. A uniform and equitable assessment base is an important consideration since the basis for distributing grants takes into account assessment data.

While awaiting the completion of the market value assessment program and a complete overhaul of the tax system, the Government of Ontario has taken a number of specific steps to ease the burden of property taxes.

These include, among others, assumption of the full costs of administration of justice and assessment; the increasing of subsidies to cities and separated towns for the maintenance and construction of roads and streets; and the granting of financial assistance for new water and sewer facilities.

The Government of Ontario believes that the existence of efficient and capable municipal organizations, with sufficient financial resources at their disposal, is a vital link in the chain of government. Effective government extending to the local level ensures a continuing concern for the environment.

HOUSING

Ontario Policy on Housing

The objective of Ontario's housing policy is to provide or assist in the provision of adequate accommodation for Ontario citizens. The report of the Advisory Task Force on Housing Policy (the Comay Report) dated August 1973, which deals principally with strengthening and improving the development of residential land and the production of housing, has been accepted in principle as the guide for the development of current housing policies.

To accomplish this objective, it is the intention of the Province "to create a climate in which government agencies and private enterprise can combine their resources to make available substantial quantities of housing at moderate cost" (1).

This policy has resulted in a number of programs. While some are being revised to suit current needs, the overall effect has produced results which are better than the national average. [25]. Ontario produces approximately 50 percent of all residential construction in Canada, both in the public and private fields. However, the rate of production is still below the requirements of Ontario residents.

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[25] *The Ontario Economic Council has urged the Province to complete current work on a comprehensive set of housing policies that would include regional allocations between public agencies and the private sector. Setting out guidelines to municipalities in application of restraints on housing mix, types, floor areas, etc. Further comprehensive studies should be initiated to define provincial objectives and to implement programs for both the Province and the municipalities in the field of social development and environmental quality.*

The 1972 Ontario Housing Corporation's housing market analysis indicates that of the 2,530,000 Ontario families, only about 40 percent (approximately 1,000,000 families) can obtain adequate accommodation on the open market. Furthermore, there are indications that the percentage is shrinking each year at an ever-increasing rate.

At the same time, the survey shows that 17 percent (approximately 430,000 families) could obtain adequate accommodation with some form of ownership assistance. The remaining 43 percent (i.e. 1,100,000 families) cannot afford to own homes and, in fact, require rental assistance to accommodate their families.

There is also clear evidence that groups requiring assistance are increasing in numbers each year.

The overall effect is that, although Ontario is producing more housing than Canada as a whole, the distribution of housing to those in need is in a worsening condition. While most of the programs devised in Ontario are technically productive, the rate of delivery continues to be a problem.

The correction of this problem is really a matter of reassessing economic priorities. Canada, for instance, allocates only five to six percent, approximately, of the gross national revenue to housing, while Scandanavia, where housing is considered to be of a higher priority, allocates approximately 8 to 9 percent.

Land Development Programs

Ontario projections for the future level of urbanization indicate the overall need in the 1971-1981 period to be 80,000 to 100,000 acres of land for residential use. Over this period, the projections indicate a total housing need of 1,250,000 units (comprised of 759,600 family units, 235,100 non-family units and 255,300 replacement units).

Ontario has carried out public land assembly in partnership with the Federal Government to supplement private land development.[26] From 1950 to 1972 some 14,000 acres were assembled in Ottawa, Kitchener-Waterloo, Toronto (Malvern) and Hamilton (Saltfleet), as well as in smaller centres such as Arnprior, Brockville and St. Thomas. Currently, an additional 5,000 acres are being assembled near Ottawa (Gloucester Township) and 25,000 acres (10,000 acres scheduled for urbanization) in North Pickering Township. Some 11,000 acres will be involved in the assembly of land for the proposed City of Nanticoke.

While the assembly of land has been considerable, (for example, the North Pickering assembly will require acquisition funds in excess of $125,000,000) the rate of installation of trunk services has been much slower. Raw land banks in themselves do nothing to meet the demand for serviced residential lots. The Toronto (Malvern) assembly, for example, took 19 years from the start of acquisition to the time when the first 650 housing units were started. The Ontario Government, therefore, is now reviewing the procedures of its several participating agencies and ministries to speed up the planning and servicing operations.

The Province has been advised by the Ontario Economic Council that a number of adjustments should be made in its administration of subdivisions. Specifically, these involve establishment of standards for services to be provided in subdivision agreements, improving community design by completion of subdivision design manual, holding design workshops, and providing study scholarships.

Ownership Assistance Programs

To supply the 17 percent of Ontario residents requiring ownership assistance, the Ontario government has developed the H.O.M.E. (Home Ownership Made Easy) Leased Lot Program, the H.O.M.E. Condominia Program, and the Tenant Purchase Program.

The Leased Lot Program, in the period of 1967 to 1972, brought 11,092 fully-serviced lots to market. The lots are leased at book value (i.e. cost) on condition that the end cost of the housing unit can be purchased for down payments in the order of $1,000. Improvements to the program are being considered.

The Condominia Program, in the period of 1970 to 1972, has brought over 15,000 housing units to market. These units were obtained by offering preferred 95 percent mortgages to developers on the condition that the end cost of the unit can be purchased for down payments of less than $1,000. While the program has provided a significant number of low-middle-income units, some adjustments in terms of unit type and design have had to be made to better suit the market.

The Tenant Purchase Program, in 1971 and 1972, brought 1,670 single and semi-detached public rental houses to market. This program is intended to assist public housing rental tenants with modestly improving income to buy their units and, eventually, public housing developments will become integrated in mixed neighbourhoods. However, the rate of purchase has been very modest; the number of public housing tenants with improving income is not large.

Rental Assistance Programs

To supply the 43 percent of Ontario residents

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[26] *In recognizing the need to locate parcels of land which would offer immediate relief to high lot costs in major market areas, the Ontario Economic Council has recommended that the Province should study properties for acquisition in a large-scale, long-term land bank program built up in co-operation with the Federal Government under the new National Housing Act provisions.*

requiring rental assistance, the Ontario Government has developed Student, Family, and Senior Citizen Rental Housing programs, as well as a Northern Ontario Assisted Housing Program.

The Student Housing Program, in the period of 1964 to 1972, produced 9,213 student units; 1,837 units were under development. These are publicly-owned buildings constructed by both public tender calls and public proposal calls, and are usually operated by the University as contract manager. The rents are at cost, based on preferred mortgage rates. In recent years this program has diminished, due to declining enrollments and a student preference to live in lower-cost communal rental accommodation without supervision. Some consideration is being given to maintaining the program by extending the service to community colleges.

The Family Housing Program, in the period of 1964 to 1972, produced 38,026 units in over 150 municipalities with about 5,000 units under development. These are produced in the same direct development manner but are rented on a rent-geared-to-income scale. They are managed either directly by the Ontario Housing Corporation or by a local Housing Authority. In recent years there has been a decline in this program, due primarily to both municipal and ratepayer association reaction to locating public housing projects in their particular neighbourhoods. Ontario is trying several alternative methods of delivery to solve this problem, examples of which are the following:

1. The Rent Supplement Program offers guaranteed five-year leases at moderate rents for scattered units to private landlords. The units are then sublet to tenants at rents geared to income. By 1972 1,845 such units were being leased. This program has successfully integrated the tenants but the landlord response has only been in areas of high vacancy rates.

2. The Integrated Community Programs offer developers access to the H.O.M.E. Leased Lot Program (extended also to Co-ops and Limited Dividend companies) on condition that a scattered percentage of the units are leased or retained by Ontario Housing Corporation and rented at the geared-to-income scale. This program has only recently been implemented and is being monitored for its effectiveness.

The Senior Citizen Housing Program, in the period of 1964 to 1972, produced 12,229 units; about 7,700 units were under development. These projects are developed by both the public tender call and public proposal call system, and are publicly-owned and operated. They offer special design features for the senior citizen and are rented on the rent-geared-to-income scale. This is probably the most successful Ontario Housing program. It usually frees under-used family accommodation at reasonable cost and is most desirable to municipalities and neighbourhood groups.

The Northern Ontario Assisted Housing Program is still under development. The objective is to produce detached housing in northern communities not yet organized. The first project at Minaki has been completed, using factory-produced 12-foot wood-frame modular box houses. The next group will be delivered as shell housing, with finishing operations carried out with local self-help labour. This program is being monitored to determine its effectiveness.

Research Programs

In addition to economic research and surveys of project requirements, the Ontario Housing Corporation has developed a modest applied-research program aimed at producing innovative housing solutions. Some of these experimental projects are described below:

1. Since 1970 several projects have been purposely aimed at systems building. Two precast concrete panel systems (Wates and Jespersen-Kay) were used in substantial condominia projects. Two factory-fabricated concrete modular box systems (Systems Construction (Ontario) Ltd. and Polymer Ltd.) were used in two rental housing projects. Several wood-framed modular box systems have been used on scattered rental housing projects throughout the Province. While none have yet achieved a significant breakthrough in housing construction, several have been competitive and are being further developed.

2. The OHC Design Competition 1972 was aimed at promoting the development of low-rise (three storey or less), medium density (20 units per acre), multiple housing forms in systems building techniques. The five winning designs are under development. A steel panel, a concrete panel, a stressed-skin plywood, a wood box modular and a wood box cube system are under development. Two projects of 80 units or more will be started this summer with a third probably being started late in the fall.

3. A second Design Competition is also being developed to produce system solutions for medium-rise (up to six storeys) medium density (40 to 60 units per acre) stacked row house projects. A detailed design criteria study will be used for the program.

4. The Zero-Lot Line project at Bramalea is primarily an experimental project in land use. Detached units are placed on lots as small as 30 feet by 80 feet, with one or more walls directly on the lot lines. The units are designed to open out on their own yard space and full privacy is maintained by careful placing of fences and planting. In addition, some 22 service standards are being applied. Phase I produced housing at about 12 units per acre (as compared with five to seven at full municipal standards) and at substantial cost savings. Both the recently completed Phase I and the next starting Phase 2 of the project were completely presold.

5. Several new projects using in-fill housing to rehabilitate and improve older deteriorating neighbourhoods are being programmed. The Hydro Block and the Dundas-Sherbourne Block in Toronto, as well as the Mohawk Gardens redevelopment in Hamilton, are being studied by feasibility consultants.

By setting the implementation of its housing policy as a firm objective, and by maintaining a flexible response to programming requirements, Ontario has produced a substantial amount of housing. By trying various methods of delivery and experimental projects, new and more effective programs are being developed.

The Ontario Government is presently implementing a number of new programs such as the Ontario Housing Action Program, the Ontario Home Renewal Program, Community Sponsored Housing Program, and several additional approaches to the Integrated Community Program. Also, consideration is being given to possible revisions to the Ontario Condominium Act.

Training in Planning and Management of Human Settlements

Several schools are now active in the training of students in urban development (6) (7b). These training programs should be founded on a broad basis to include all segments of society both at the adult and elementary educational level to be of benefit domestically and elsewhere in the world (5). They should not be restricted to college level.

While Ontario universities do provide a whole range of professional and technical training courses related to the planning of human settlements, there is a great gap in the training for the management of human settlements.

Special courses are available for hospital administrators, but housing administrators receive only on-the-job training. While Ontario Housing Corporation has introduced some in-house training, the development of meaningful specialized training facilities at the professional level would be welcomed.

With the growth of multiple housing forms (apartments, town houses, etc.) the need for professional managers will increase in both the private and public sectors. Nearly 40 percent of Ontarians are resident in such accommodation and the ratio is climbing.

HEALTH AND NUTRITION

In Canada, nutrition programs have been developed at all three levels of government to deal with disease arising from malnutrition (13). Only pockets of malnutrition exist in Canada, but it is a serious problem in some developing countries. Food shortages may lead to strong pressures for development of the food resources of the globe, and the funnelling of food to some of the developing countries. Surplus food from some parts of the world could be made available to the hungry by better transportation and economic inducements.

Support should be given to the World Health Organization for development of criteria for the protection of public health, including protection for workers against environmental agents at places of employment (76).

Both Provincial and Federal Governments provide grants for environmental health research in epidemiology and toxicology. Research funds should be made available on a priority basis. Grants are made currently on an ad hoc basis to institutions. Projects overlap and some areas are not adequately researched because a co-ordinated overview is lacking.

An international system to correlate medical, environmental and family history data (76b) is needed, as well as an administrative arrangement whereby provincial, federal, and international data on public health is incorporated in a data bank readily available to all responsible agencies.

Food Production

We eat to live, but food has a much greater impact on the quality of life in any society than simply a life-maintaining force. The food production system is a major contributor to the economy. The social structure that has developed in rural areas where primary food production occurs has stood the test of time, and exerts a modifying influence on the complex social issues resulting from urbanization.

Ontario is concerned about the increasing competition for the use of its limited supply of food-producing land. Systems are being developed to ensure that regional planning strategies and development patterns reflect Ontario's need to maintain an adequate food-producing land base to retain the contribution its food production system makes to the quality of life.

Development of Primary Standards or Criteria for Air, Water, and Food

International standards for the protection of human health from pollutants in air, water, and food, and occupational hazards from environmental agents should be established (81). Some limits will be based on toxicological work on animals, others on epidemiological observation of exposed humans.

The Federal and Provincial Governments should be asked to provide support to technical committees of WHO, ILO, FAO and to recommend international standards. Provincial and local expertise in these matters should be utilized. In the past, many of the invitations to Canadians to act on international agencies have been referred only to the Federal Government.

The Codex Alimentarius Commission is developing standards for contaminants in foods important in international trade (82). The Commission should not limit its concern to international food items. Many of the pollution problems

in the human food chain involve local and indigenous populations, e.g. Minamata Bay, Japan, where mercury was found in fish for human consumption. The work of the Commission should be expanded to protect public health against food contaminants wherever they occur. A broader representation of the countries of the world should be included on the Commission.

Research and Monitoring of Food Contaminants

Canadian foodstuffs are being monitored both federally and provincially (78). Data collected is being disseminated, but a freer exchange of such information should be encouraged.

Health, Agriculture and Food, and Natural Resources Ministries are involved in the monitoring of food in Canada, but in some cases, data collected are regarded as research information, and confidential, rather than being freely offered to any responsible, interested agencies, particularly any other level of government up to the international level.

Monitoring of Air and Water Risks to Health

Air and water monitoring of risks to health is conducted at the provincial and federal levels (77). There is an abundant expertise in Canada at both levels to assist U.N. agencies in developing countries. The World Health Organization has been requested to provide assistance to developing countries for pollution-monitoring programs.

Early Warning Systems

In Ontario, the Environmental Health Effects Service (76a) is a division of the Environmental Health Services Branch. This special service is engaged in long-term studies of the effects of environmental agents on public health, including chronic toxicity, mutagenic, teratogenic, and carcinogenic effects. The studies are well advanced but the program would be aided by funds for contract research on environmental health. The Environmental Health Effects Service should have access to all environmental data, and morbidity and mortality statistics as recorded by the Ontario Health Insurance system.

Recommendation 76a is also covered in some measure by the Canada/United States Agreement on Great Lakes Water Quality, particularly in reference to consultation on contingency planning, special situations, and with reference to hazardous polluting substances. The Agreement defines such substances as "any element or compound . . . which presents an imminent and substantial danger to public health or welfare . . . including but not limited to human health", and states that the parties to the Agreement shall consult from time to time for the purpose of identifying harmful quantities of these substances.

RECREATION

Since affluence and leisure are increasing in developed countries, recreation programs are becoming increasingly important. The needs of the individual and his utilization of leisure time are being studied with a view to improving recreational facilities. The Provincial Parks System of the Ministry of Natural Resources and Conservation Authorities, as well as recreational programs under the Ministry of Community and Social Services, play a major role in meeting recreational needs. Numerous recreation programs are being developed by municipalities to meet increasing public demand.

The Province has developed a network of parks that endeavours to meet many of the recreational needs of society, whether it be the wishes of those desiring the natural untouched setting, i.e., primitive, wild river, or a more planned setting, such as camping. The vast tracts of Crown Land provide excellent opportunities for activities such as canoeing, hiking, and fishing. Also, as noted, there is a trend towards urban-oriented parks.

The Provincial Parks System consists of five classes of parks — primitive, wild river, natural environment, recreation, and nature reserve. Recently, two urban-oriented provincial parks (Bronte Creek near Toronto and Pelee Island near Windsor) have been established to serve growing urban populations. However, many more such parks are required to adequately meet urban needs. Two primitive parks are in operation (Polar Bear and Killarney) in an attempt to meet part of the demand for wilderness recreation.

About 115 provincial parks, administered by the Ministry of Natural Resources, provide recreation in aesthetic and natural settings, with conservation authorities playing a more local role in outdoor recreation. Ontario's provincial parks have been designed to provide a full range of recreational opportunities ranging from day-use picnicking to wilderness canoeing (62). To meet demand for high quality recreation the Ontario Ministry of Natural Resources has committed an additional 120 park reserves for future recreational use.

The need for sound recreational planning is especially critical if recent trends in the United States are considered, bearing in mind that Canada is experiencing the same trends with a slight time lag. During the last 40 years, the population of the United States increased by about 70 percent, while forest recreation visits increased by 3,000 percent. The current rate of population growth in the United States is about one percent per annum, while the demand for outdoor recreation is increasing at a rate of six to eight percent. These statistics indicate the heavy demands for outdoor recreation facilities which will face Canada and the provinces.

To achieve a more complete understanding and measurement of outdoor recreation demands, Ontario participated with the other provinces in the Canada Outdoor Recreation Demand Study (CORDS). In Ontario, an inventory was made of some 12,000 public and private outdoor recreation facilities in both urban and non-urban areas and the data were tabulated for an overall description of the supply picture. Also, a park visitor study was carried out at some 36 provincial parks in order to gain an insight into the locational, travel, and socio-economic characteristics of park visitors as well as their activity and use patterns.

Closely integrated with the CORDS program is the Tourist and Outdoor Recreation Plan (TORP) program which will lead to development of capability for the examination of alternative recreation plans and a better understanding of the outdoor recreation system.

Surveys of recreational boating traffic on the Trent-Severn Waterway, were made to produce an adequate data base for the Canada-Ontario Rideau-Trent-Severn Study. Such data were used in the formulation of a plan for the future development of the Rideau-Trent-Severn land and water recreation corridor between Ottawa and Georgian Bay and implementation is currently underway.

As part of the refinement of the Toronto-Centered Region concept, an approach or framework for the formulation of a comprehensive outdoor recreation and open space plan has been devised and should prove invaluable in the production of an overall TCR plan.

Special projects designed to help meet the demand for outdoor recreation involve the acquisition of about 30,000 acres of land on the Niagara Escarpment, a unique southern Ontario land feature. In order to formulate a long range park-community plan for the Wasaga Beach area, the Province contracted the services of a consultant, whose revised plan is now being implemented. Since 1963 there has also been an ongoing program involving the acquisition of substantial portions of the Great Lakes shoreline to be reserved for public recreational purposes.

The Ministry of Community and Social Services administers numerous cultural and recreational programs, the objective of which is increased participation on the part of community groups, municipal departments of recreation, sports-governed bodies (of which there are 56 in Ontario) and community schools. The Ministry is involved in the development and co-ordination of leisure and recreational programs and cultural programs.

Assistance is offered colleges and universities including recreational and adult educational programs. The Ministry provides service and assistance to municipalities in such matters as program development, leadership training, organizational development and assists in the assessing and upgrading of the professional competence of municipal recreation personnel. The municipal recreation departments, unorganized districts and Indian bands are assisted financially through grants under the Programs of Recreation. Grants are also provided for the construction and renovation of recreational facilities (i.e., arenas, indoor and outdoor swimming pools, hockey rinks, track and field facilities).

Grants to municipalities for the development of local parks are made by the Ministry of Natural Resources under the Parks Assistance Act. Through the Ministry of Industry and Tourism the government aids the private sector in the provision of recreation opportunities.

ENERGY

Needs

Ontario is a highly-concentrated energy market. Being a highly industrialized province, much of the economic base depends upon the intensive use of energy. As an illustration of the close links between economic development and energy consumption, the real gross domestic product in Canada since World War II increased at an average annual rate of 4.7 percent while energy consumption increased at 4.6 percent.

Nevertheless, while the total energy consumption has moved ahead with economic development, the form of energy consumption has changed. Coal as the primary energy source has been displaced by oil and natural gas. In addition, improved standards of living have increased electrical consumption. For instance the modern Ontario home contains a large number of electricity-using devices such as vacuum cleaners, washers, dryers, stoves, refrigerators and freezers; comfort items such as air conditioners, humidifiers, dehumidifiers, and air cleaners; entertainment items such as radios, televisions, tape recorders, and phonographs, to mention but a few.

Approximately 27 percent of the 1970 total consumption in Ontario was accounted for by the residential and commercial sectors. About three-quarters of this was required for space heating. In the household, energy consumption for space heating is followed in quantity by lighting, water heating and use of appliances. Commercial uses are predominantly for space heating and lighting. The transportation sector accounted for about 17 percent of the 1970 total energy consumption, with fuel requirements for motor vehicles accounting for about four-fifths of this percentage.

Energy demand by industry accounted for about one third of the total 1970 energy consumption in Ontario. Present trends indicate that by 1980 industrial consumption will be continuing at the one-third level. Electricity consumption in Ontario in 1971 was distributed as follows: 22.4 percent residential, 13.7 percent commercial, 47.2 percent industrial (including utility plant use)

with 16.7 percent losses and unallocated. About one-third of the industrial consumption is accounted for by the primary metals and pulp and paper industries.

Demand for electricity has been doubling every decade, corresponding to an average long-term growth rate of about seven percent (59). Canada stands second on a world basis (with Ontario slightly below the Canadian average) in the per capita use of electricity.

As consumption of energy increases, more and more attention will be required to control pollution.[27] The public is becoming more aware of the hidden cost of environmental degradation resulting from the consumption of energy and the priorities placed on the manufacture of convenience and consumer goods. The size and nature of the energy market make it unlikely that consumption practices will change quickly.

Public reaction has been favourable towards the concept that technology can reduce the environmental impact of energy use to tolerable levels. This would mean that costs of certain goods and services, including energy may become higher if the quality of life in a healthy environment is to be maintained.

Examples of health-related questions yet to be considered in assessing the environmental and social costs of a variety of activities associated with the energy industry include:

- health hazards in mining (lung cancer from radon gas)
- health hazards in nuclear fuel manufacture along with costs of medical supervision
- health risks (along with environmental risks in siting nuclear power plants and planning of emergencies).

Another approach gaining acceptance is related to per capita consumption levels, with the suggestion that population distribution be adjusted until an ecologically-balanced society results. This involves a basic change in the structure of our society and would require very careful evaluation.

There are major areas of energy use where greater efficiencies should be early objectives. These are: in the residential field—improved insulation and better furnace efficiency; in the commercial field—low-energy-consuming designs, considering such factors as building orientation, limits of glass area, higher insulation standards, lower lighting intensities, and energy-conserving mechanical devices; in the transportation field—intercity rapid transit for passengers and freight, urban transit systems as an alternative to the private automobile, with more efficient automobile engine design, in the manufacturing field—more efficient industrial application; and in the electric power field—improved efficiency in thermal generating stations and discovery of applications for waste heat. Generally, the various forms of energy should be allocated to applications for which they are best suited and energy wastage should be discouraged.

Siting of Generation Stations and Transmission Corridors

The Ontario Hydro Electric Power Commission has the responsibility of siting, constructing and maintaining facilities for the bulk production and transmission of electrical power. Through its Generation Concept Department, generating station sites are selected for the next thirty years. These sitings can exert significant impact on the environment and on the economy.

Transmission distribution routes are selected to minimize the environmental and community impact. Consideration is given to possible conflict with present or proposed municipal land-use plans, land-severance patterns, road and water crossings, the number of woodlots affected, agricultural capability, the visibility of the lines from public recreational areas and established communities, and the number of buildings on the right-of-way.

An attempt is made during the construction and maintenance phase, to blend facilities into the surrounding landscape by the use of low-profile transmission towers, selective vegetation cutting, tree screen planting, reforestation, seeding and landscaping. The Province is endeavouring to preserve the natural beauty of the landscape adjacent to its power facilities so that people have the opportunity to fulfill their aspirations for a life of quality.

TRANSPORTATION AND COMMUNICATIONS

Needs

The greater mobility afforded by transport including air travel is highly valued by today's urban resident. Transport may be called a resource-enriching element in urban life in that it gives city dwellers more time, more space, and more opportunity for a fuller life. The radius of cities has been extended to embrace new suburban developments. Closer association between outlying communities and the city has been promoted. Urban dwellers have greatly increased their job opportunities and social contacts as a result of shorter travel times, and the shopping centre has introduced new methods of retail business. Mobility for the city dweller provided by alternative methods of transportation has also meant more variety of recreation, more vacations, and more weekends away (4). For many it has made possible a house in the city and one in the country or at the beach.

There are obstacles to realizing the full advantages of transport. For low income individuals unable to afford an automobile or drive one, the specialization of transportation particularly in urban areas severely limits their mobility. Dis-

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[27] *Impact of Energy use on the Environment in Ontario, Ontario Advisory Committee on Energy, March, 1973*

tances are too great for walking and public transport is unavailable. Even those who own automobiles and can drive are increasingly victims of traffic snarls, during the 20 rush hours each week. Traffic problems are usually minimal at other times.

Expressways as a means of solving urban transportation problems are too expensive for the amount of traffic moved. The capital cost of a six-lane urban freeway ranges from $10-35 million per mile. In addition, there are adverse social, environmental, and economic effects in the form of air pollution, noise, displacement of families, disruption of neighbourhoods, and loss of buildings, park areas, and tax base.

Recognition of adverse automobile impacts has led to increased interest in public transportation. The major problem with public transit is its lack of attractiveness to users. An analysis in Metropolitan Toronto indicates approximately 30 percent of all trips are made by public transit. Perhaps a relatively low proportion of transit riders do so by choice, while the great majority are "captive riders", in that they have no alternative. Since public transit systems cannot equal the convenience of private vehicles, use of the automobile continues to grow.

Subways and buses limit individual service. Subways are capable of delivering 40,000 passengers per hour per direction at a cost of $30-40 million or more per mile. They are not justified at peak hour demands of less than 20,000 passengers per hour per direction. Such demands exist along only a few corridors, even in large cities, and the high cost of subways makes extensive networks prohibitive. While subways provide frequent and reliable service, access times to the system may be long except for people living or working immediately along the subway route. Also, the high capital cost of subways makes it difficult to provide attractive fares without massive subsidies.

Towards the lower end of the capacity range are buses with typical capacities on shared rights-of-way of about 3,000 - 6,000 passengers per hour. The use of shared right-of-way (i.e. on city streets in mixed traffic) helps keep the capital cost down, as opposed to exclusive right-of-way, but high operating cost and unattractive service for the user result. Bus operating costs on city streets are high, partly because bus transit is labour intensive (i.e. requiring an operator for each vehicle). As labor costs increase, bus operating costs and fares are likely to rise quickly, making service less attractive to the user.

In addition, because bus service operates in the congestion of mixed traffic, long unappealing travel times result. Long access time, infrequent service, unreliable schedules, transfers, and crowding are common with bus transit. The high operating costs of buses lead to a vicious circle of decreased service caused by declining patronage, and so on.

These comments on subways and buses are not intended to imply that such systems do not have feasible applications, but they do demonstrate the deficiencies in these systems.

Programs

All transportation matters are handled by the Ontario Ministry of Transportation and Communications, thus making it possible to plan and coordinate not only highways, but rail, air, and urban transportation, and all forms of communication.

Financial programs in the urban transportation field include:

(a) a 50-percent grant to municipalities for road construction and maintenance;

(b) a higher rate of grant for provincial highway connecting links through municipalities;

(c) a 50-percent subsidy for deficits incurred by public transit systems up to a maximum limit;

(d) a 50-percent subsidy for subway construction as well as equipment and rolling stock costs;

(e) a 75-percent subsidy to municipalities for the purchase of buses, streetcars, trolley buses, and related facilities;

(f) a 75-percent subsidy to municipalities endeavouring to develop intermediate-capacity transit systems. (i.e. between 6,000 and 20,000 passengers per hour per direction);

(g) a 50-percent subsidy to urban areas desiring to upgrade computer-controlled traffic systems;

(h) a 75-percent subsidy of the cost of studies into the reduction of peak-hour congestion through staggered working hours;

(i) and a 75-percent subsidy of transportation studies of such concepts as one-way streets, scheduling of commercial servicing and deliveries to off-peak hours, and parking policies.

Intermediate Capacity Transit

In an effort to promote the development of intermediate-capacity transit, which features smoothness and quietness of ride, energy conservation, lack of pollution and attractive appearance, the Provincial Government is building an operating prototype as a demonstration project.[28]

Such intermediate-capacity transit modes are relatively economical, with capital costs ranging from $13 million or more per two-way mile. Hence, two or three miles of such a system can be built for the same cost as one mile of subway.

Utilization of Existing Rail Lines — Go Train Service

In a practical experiment to utilize existing rail lines for commuter transport, the Government of Ontario has operated a GO Train service for the past five years. This provides efficient suburban

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[28] *CNE experimental Krauss-Maffei system planned for completion by 1975.*

transportation for those who prefer not to drive or who do not own cars. This service has effectively removed about 14,000 cars each day from the highways along the Lake Ontario shore near Metropolitan Toronto. Express bus service has also been instituted under the GO Transit program.

Dial-A-Bus

Further pioneer work in the field of municipal service has also been done by the Ministry of Transportation and Communications with the Dial-A-Bus service which provides improved and more economical bus service by not employing a fixed feeder route. Seven municipalities in Ontario are using this service and further implementation in other areas is expected.

Regional Transportation Networks

The Ministry of Transportation and Communications is participating in the development of area and regional transportation networks which embrace all modes (i.e. road, rail, air, and water) of transportation.

Consideration is given to socio-economic factors such as community and school boundaries, access to shopping and recreational areas, the number of properties directly affected, property tax changes due to impact of transportation facilities, the effect on business, and official plans. Environmental factors considered include possible air and noise pollution, the sensitivity of watersheds, the silting of streams, the setting of vegetation, the number of trees, topographical changes, and aesthetic factors. Also considered are capital costs, property and road-user costs, travel time saving, maintenance costs, compatibility with existing networks, adaptability, accessibility, level of service, and user's perception.

PROBLEMS OF AIR QUALITY

Air Pollution, particularly fine acidic particles from combustion, causes soiling of property, clothing and furnishings. An equally important result of this and other types of contaminant are the effects on human health, chronic and occasionally acute sinuses, bronchial and lung irritations and possible resultant economic loss due to absence from employment. Corrosion and deterioration of metals and building materials are significant losses, and reduced growth and quality of flowers, fruit, vegetables and forest products affect every person in some way or other.

Interference with visibility is an aesthetic loss which often contributes to highway and travel accidents. The United States Public Health Service has estimated that the annual overall cost of air pollution is about $60 for every man, woman and child.

Air pollution is a most complex and dynamic problem. Weather plays an important role. Changes can transform dark skies laden with heavy air pollution to clear blue within minutes. Major pollutants are sulphur oxides, coarse and fine particulate matter, carbon monoxide, hydrocarbons, nitrogen oxides and photochemical oxidants. Compounds of mercury and lead are highly toxic. Combinations of pollutants may be more damaging in effect than the sum of their individual effects.

Particulate Matter

The main sources of man-made particulate pollution are from coal and oil-burning power plants, municipal and apartment incinerators, industrial processes, metal refiners and smelters, domestic oil burners, construction and demolition of buildings, and the fine submicron particles from automobile and diesel exhaust systems.

This category includes smoke (carbon soot particles produced by incomplete combustion), dust (solid particles produced as a result of any disintegration process), fumes (solid particles produced by sublimation, distillation, calcination, or chemical reactions), and mists (liquid particles from chemical reaction, vapour condensation, or atomization of a liquid).

Health effects of particulate matter are threefold;

(a) the particles are dangerous in themselves (e.g. asbestos and lead);

(b) the particles neutralize the body's natural defense mechanisms, thus paving the way for a deadly attack by some other substance;

(c) the particles may act as carriers for some toxic substance. Effects on vegetation can include inhibition of photo-synthesis and death or injury of leaf tissue.

Sulphur Oxides

The major sources of man-made sulphur oxides are the combustion of coal and petroleum fuels and the smelting of sulphur-containing ores. It is estimated that 97-98 percent of the sulphur in coal and oil is emitted from the smokestack as sulphur dioxide and only 2-3 percent as sulphur trioxide. Once the sulphur oxides escape from the smokestack, they can undergo a series of complicated chemical reactions to produce a thick and dirty smog.

Although both sulphur and photochemical smogs result during air inversions and cause considerable eye and throat irritation, poor visibility, and plant injury, there are essential differences. Photochemical smog oxidizes—that is, the ozone molecule in the smog changes the composition of substances it comes into contact with by giving up one of its oxygen atoms.

The sulphur-produced smog reduces—that is, the sulphur oxides take away oxygen atoms from the substances with which they react. In addition, photochemical smog occurs on sunny and warm days, whereas sulphur smogs show up usually on cold moist days.

Carbon Monoxide

When the combustion of fossil fuels and organic materials such as gasoline, coal, kerosene or wood is incomplete, tasteless, colourless and odourless carbon monoxide (CO) is prod-

uced. In terms of weight it is the most common man-made pollutant, with motor vehicles accounting for most of the world's man-made carbon monoxide. While death is the predictable result of exposure of persons to air concentrations of 500 - 1,000 ppm CO, there is considerable disagreement in scientific circles over the long-term effects of air containing 5 - 10 ppm CO.

Oxides of Nitrogen

Of the eight nitrogen oxides which are possible, two are of the most concern, namely nitric oxide and nitrogen dioxide. Besides natural production, man artificially produces nitrogen oxides through the burning of fossil fuels in transportation systems, homes, factories, offices, and generating stations. Most nitrogen emissions from automobiles are simple nitric oxide, a colourless, tasteless, and relatively harmless gas.

Unfortunately, once in the atmosphere, nitric oxide picks up another oxygen atom to form nitrogen dioxide — a reddish pungent gas having several adverse effects. Nitrogen dioxide can turn the air yellow or brown and cut visibility. It can damage some dyes and fabrics as well as irritate the eyes and throat. It is also an essential ingredient in photochemical smog. Low concentrations and long-term exposure of plants to nitrogen dioxide can inhibit plant growth.

Hydrocarbons

In an automobile without emission control, 55 percent of the hydrocarbons appear from the exhaust, 20 percent from fuel tank and carburetor evaporation, and 25 percent from crankcase blowby. Generally hydrocarbons are not dangerous to health at levels found in city air. However, in the presence of sunlight, hydrocarbons can react with other substances in the air, particularly nitrogen compounds, to form photochemical smog containing ozone and other oxidants. These oxidants can cause plant injury and irritation of human tissue.

Air Pollution Index and Alert System

The Air Pollution Index and Alert System is in force in Metropolitan Toronto, Hamilton, Sudbury, Windsor and Welland. The index is a 24-hour running average of sulphur dioxide and solid particulate values. Voluntary curtailment of industrial emissions is requested whenever the Index reaches 32, and should the Index reach 50 and adverse meteorological conditions are forecast to persist for at least six hours, industries can be ordered to curtail their operations.

WATER SUPPLY AND POLLUTION CONTROL

It is becoming increasingly common for municipalities to experience water shortages, expecially in urbanized southern Ontario with its high growth rate. While this is not so much a problem for municipalities located immediately adjacent to the Great Lakes, it is a growing problem for those located further inland in the upper parts of watersheds draining into lakes.

Traditionally, such urban areas have relied on ground water or local watercourses as their source of supply but the potable water demands of growing populations have often taxed to the limit the capacity of local aquifers and streams. In a number of instances, the construction of a regional pipeline, utilizing the Great Lakes as the source of supply, has been the only method of alleviating such situations. (10).

The situation with respect to sewage treatment services is somewhat similar. As urban areas continue to attract people, small communities, which, in the past, relied on septic tanks, now experience pollution problems with increasing residential densities. Hence, there is a continuing need for communal sewage systems and for provincial aid in financing and constructing such works.

For municipalities already served by communal sewerage systems, increased urban development pressures are manifesting themselves in the need to extend the collection systems and expand the treatment works. Critical situations often arise when municipalities are located on the upstream portion of drainage basins. In these instances, the assimilative capacity of local watercourses to receive treated sewage effluent is often exceeded and stream conditions deteriorate.

Rectification may be achieved through the construction of regional sewage pipelines which transfer sewage to treatment works located along the Great Lakes with their greater assimilative capacity. Regional schemes such as that under construction in South Peel County and that proposed for the Central York and Pickering areas have thus been promoted.

Municipal water supply and sewage treatment projects in which Ontario's Ministry of the Environment has been financially involved, up to the present time, have usually been designed to correct servicing inadequacies and pollution problems. The projects have not been specifically intended to open up large tracts of land for development, even though the design does, in fact, allow for some measure of development within the service area. This program will be an essential element in the development of regional planning objectives and thereby an important factor in helping to solve the present housing crisis. The effect of this strategy would be to increase the supply of serviced land to the point where deflationary pressures would serve to reduce existing inflated serviced land costs.

SOLID WASTE AND LITTER

Needs

Waste management[29] includes the complete system of storage, collection, transportation, treatment and disposal of waste. During the past ten years, especially, there has been a sudden awakening to the immensity and complexity of the waste collection and disposal problem.

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[29] *Refer also to Chapter 1, Waste Management, for a review of industrial solid and liquid waste and hazardous wastes.*

Quantities of solid waste requiring collection by private and public agencies have been vastly increased because of increases in urban population, packaging, and convenience merchandise.

Agricultural wastes and sewage sludge disposal are also of immediate concern. Vast quantities of manure result from the operation of livestock and poultry units. Traditionally, this farm waste, which is purely organic, has been disposed of by spreading modest amounts on fields as fertilizer. However, as the quantities involved have increased and the land area available for disposal has decreased, the capability of the soil to satisfactorily absorb this product (particularly nitrogen) has been exceeded, with resulting environmental problems.

Besides agricultural wastes, sewage sludge disposal problems are expected to increase with the implementation at sewage treatment plants of nutrient control. It is estimated that sludge volumes will increase by 20 percent with the use of iron and aluminum salts. No volume increase is expected with the addition of lime; however, the sludge density will increase.

Other areas of waste management involve litter and abandoned vehicles. The blight of abandoned automobiles along highways and adjacent areas has caused much public concern because of impaired aesthetic values. It is estimated that about 400,000 vehicles have been abandoned in Ontario.

The distribution of these vehicles across the landscape is by no means uniform. When the price of scrap metal is high, as it has been recently, private operators can afford to collect all abandoned vehicles within a reasonable distance of reclamation centres. For example, all abandoned automobiles within 50 miles of Metropolitan Toronto have been cleared for this reason. However, at greater distances from reclamation centres the economic incentive diminishes.

Thus, during a recent survey of selected areas in Ontario, which in total represented 5 percent of the land area, 95,000 vehicles were found abandoned on public property or left as useless on the owner's property. The extent of the litter problem is not yet fully known but the results of a recent survey are presently being analyzed.

In addition to legislation, an educational program involving television, radio, and newspaper advertising is continuing with increasing intensity. (7) Efforts are also being made to develop a litter index which would include the weight, number and nuisance value of litter items.

NOISE

Since noise levels in all communities are expected to increase as the number of vehicles increases, noise regulations are being devised and drafted to implement this aspect of the Environmental Protection Act. These regulations propose to set permitted operating vehicle noise levels for licensed road users and stationary source noise levels for industrial, commercial, and residential areas. (14). Control of noise arising from aircraft and railway operation is proposed to be handled by the Federal Government.

Framework for Action in Ontario

DISTRIBUTION OF POPULATION AND ASSISTANCE

Confronted by evidence of resource depletion and environmental damage, new policies are required at all levels of government in Canada where these are lacking to address the environmental problems created by rates of population growth, concentrations of population and related imbalances in resource use and consumption. As efforts to address imbalances require redirection and strengthening, the federal and provincial governments should act in concert to develop a co-ordinated national approach to problems of population distribution and developmental assistance.

URBANIZATION

Efforts should be intensified through the Design for Development Program to determine the optimum size for existing and proposed urbanization in the planning regions of the Province based on the environmental consequences of development of water- and land-based resources, energy, housing, utilities, transportation and recreation facilities.

Increasing emphasis should be placed on the humanizing of urban areas and reduction of growth pressures on metropolitan areas by providing economic incentives for the location of industries in designated areas, by assembling and servicing landbanks for reasonable-cost housing and by decentralizing government services.

MUNICIPAL ORGANIZATION

As continued effort is made to strengthen municipal governments through regionalization, with consolidated and better equipped municipal councils, the capacity for implementing sound development strategies, consistent with the maintenance of environmental quality, will be enhanced. In its review of the Planning Act, the government should consider the recommendations of the Ontario Economic Council with respect to regional and municipal planning, development control, zoning, urban renewal, subdivision control and planning implementation.

With conclusion of the Government's Municipal Tax Reform Program the opportunities for local governments to meet the challenge of providing adequate services will be greatly improved.

As the structure of regional government develops further, it is expected that people in a common area will be better equipped to pool their resources for more equitable sharing of benefits and costs in regions. The Province should monitor the effectiveness of regional governments, and

initiate adjustment to boundaries and responsibilities as needed to implement municipal programs for the maintenance of environmental quality.

HOUSING

Legislative and financial arrangements should be made to encourage prompt servicing of government land assemblies to ease the shortage of serviced land and decrease inflated land values.

The relationship between land taxes and municipal services and the funding of capital and development expenditures warrant examination with a view to determining the feasibility of introducing improvements in property taxation. Continued seeking of feasible methods for rebating tax surcharges on building materials employed in construction of residential dwellings should be encouraged to reduce costs to house purchasers.

Standards for services contained in subdivision agreements should be consistent and efforts to improve community design should be encouraged.

The Province and the building materials industry should promote a self-help program in the form of instruction and an advisory service so that individuals can participate in the construction of their own dwellings. This saving in labour cost would decrease the price of dwellings.

Education of students enrolled in urban development programs should be founded on a broad basis to include all segments of society both at the adult and the elementary educational level to be of benefit domestically and elsewhere in the world (5). Programs should not be restricted to the college level where emphasis could be placed on training for the management of human settlements.

HEALTH

There is a considerable body of expertise at the provincial and municipal levels which Canada should muster for the protection of human health. This expertise could be utilized in the development of international standards for the protection of air, water, food, and workers exposed to environmental hazards.

An international system to correlate medical, environmental and family data would require a co-operative arrangement among provincial, federal and international agencies.

The exchange of health-related information among agencies of the Ontario Government should be extended to include data on air and water quality.

A concentrated effort should be made to promote the free exchange of information relating to programs of research and monitoring of food contamination among the agencies of the various levels of government.

The Province should engage in the monitoring of factors which may affect the health of people, particularly of those in situations where there are special risks in exposure to environmental agents.

Consideration should be given to expanding the work of the Codex Alimentarius Commission in the development of international standards for pollutants in food. The Commission should not limit itself to foods important in international trade because many problems relating to the food chain have involved local and indigenous populations.

RECREATION

Comprehensive outdoor recreation and open space plans for each of the five economic regions in Ontario should be prepared so that acquisition and land-use control strategies can be developed and implemented in the near future.

Outdoor and indoor recreation facilities should be planned to complement one another so the full range of recreation opportunities is available to urban and rural residents.

ENERGY

Greater research should be undertaken into energy sources which do not severely impact the environment either through production, or transmission, and including alternative non-conventional sources of energy.

As well as searching for applications to utilize waste heat, conservation of energy should be promoted by encouraging the construction and manufacture of more efficient, less-power-consuming products, structures and related facilities and methods of transportation.

TRANSPORTATION AND COMMUNICATIONS

Efforts to promote staggered work hours for the private and public sector to reduce peak hour traffic volumes and transportation investment requirements should be continued. The public should be advised of the reasons for these practices to encourage their acceptance.

The Province should examine methods of encouraging the use of railways for freight movement by such means as revised freight structure and subsidies.

The introduction of intermediate-capacity rapid transit for selected metropolitan areas should be hastened and the development of flexible urban transportation systems further promoted.

STRATEGIES FOR ENVIRONMENTAL PLANNING

Regional planning strategies and development patterns outlined in official plans and zoning bylaws should reflect requirements for control of air and water quality, soil pollution and noise.

WATER SUPPLY AND POLLUTION CONTROL

To encourage water conservation where water supply or water quality may be critical, municipal

water and sewage rates should be based on the volume of consumption or waste production.

Where feasible, the use of land disposal techniques for municipal sewage treatment plant effluent should be undertaken to reduce the pollution load on watercourses.

The principle of the "polluter must pay" should apply universally to organic, inorganic, and thermal discharges from municipalities and industries.

WASTE MANAGEMENT

The Province should promote the reusability of products and the manufacture of more durable and more readily reclaimable consumer products to reduce the volume of "obsolete" wastes. Thereby, the purchasing power of the consumer would be protected and cost problems of storage and disposal of wastes reduced. A penalty tax on wastes which do not easily lend themselves to reuse or reclamation, should be considered. Further consideration should be given to taxing non-recyclable materials.

Severe fines or other forms of punishment should be imposed for littering and illegal dumping. Consideration should be given to the denial of contracts, grants or loans to companies convicted of violating anti-pollution legislation.

Chapter 3
ECONOMIC CONSIDERATIONS

Ontario View of Principles

The Declaration of the United Nations Conference on the Human Environment proclaims in Principle 10 that, "For the developing countries, stability of prices and adequate earnings for primary commodities and raw materials are essential to environmental management since economic factors as well as ecological processes must be taken into account."

And in Principle 11 that, "The environmental policies of all States should enhance and not adversely affect the present or future development potential of developing countries, nor should they hamper the attainment of better living conditions for all, and appropriate steps should be taken by States and international organizations with a view to reaching agreement on meeting the possible national and international economic consequences resulting from the application of environmental measures."

Principle 12 proclaims that, "Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and any costs which may emanate from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose."

These Principles emphasize the economic impact of environmental considerations on development, trade and foreign aid and give recognition to the need for stable economic systems to assure continuity of support for environmental management.

A corollary might be that governments place environmental considerations in a more central position in the spectrum of social priorities.

Acceptance by all states of environmental policies that enhance and do not adversely impact the potential of developing countries was a matter of utmost concern to the Conference and became embodied in Principle 11. Agreement was reached on the need for consultation through the General Agreement on Tariffs and Trade (GATT) and other institutions concerning the economic consequences of environmental measures.

In the context of Canadian economic experience the following points emerge:

1. Because of the economic interdependence between the provinces and regions of Canada and members of the international trading community, economic instability in any part of Canada or another country may have adverse implications for environmental management, especially as environmental management is dependent on the economic system.
2. Consensus on environmental programs should be sought to avoid discriminatory policies.
3. Because of disparities of development, governments should exchange technical and other essential assistance required by less-developed regions or countries so they can carry out their environmental responsibilities.

The principles emerging from the Stockholm Conference lay heavy stress on the need for tempering policies of growth with a wide range of environmental and ecological considerations. Happily, a number of aspects of Ontario's policies relating to economic growth and change are beginning to reflect a deep concern for these same considerations. Unlike the great majority of developing countries, where concern for environmental problems has been often overbalanced by the drive for economic growth, the people of Ontario are increasingly aware of the environmental dangers of untrammelled growth. The sensing of the need for a channelling of growth in Ontario is abundantly apparent from the policies inherent in the Province's Design for Development and other related programs, examples of which are:

- legislation and programs to deal with urban congestion and preservation of desirable land uses;
- establishment of the Ministries of Energy and Housing to organize energy and housing needs for future development in Ontario;
- development of a greater balance of public facilities in rapid-growth areas, e.g. public transit with a lower propensity for pollution, as compared to private vehicles with equivalent carrying capacity;
- improved design standards for public and private facilities to reduce environmental problems, e.g. improved standards for highways to cut noise levels; refinements at sewage treatment plants for reduction of nutrients; guidelines for subdivision designs and standards for services;
- institution of controls over private enterprises which pollute the environment—controls aimed at reducing pollution to a socially acceptable level, and at internalizing social costs;
- broadening and strengthening of controls over use and depletion of renewable and non-renewable resources.

In developing future policies the challenge will be to introduce further safeguards over the envi-

ronment without arbitrary restriction of economic initiative.

Summary of U.N. Recommendations

Stemming from the principles are recommendations for action in the following areas:

(a) Developmental Planning

Recognizing that environmental technologies should be employed globally, the Secretary General has been asked to find ways and means of accomplishing this objective without imposition of non-acceptable burdens on developing countries (108).

Other recommendations involving the governments concern:

- the establishment by both the Secretary-General and governments of an international fund or financial institution to assist national programs for human settlements and development by providing seed capital and technical assistance in mobilizing domestic resources for needed improvements (17);
- preparation of short and long-term plans for evaluation of major environmental problems within countries;
- development of solutions, both preventive and remedial, to problems including alternative solutions and approaches to development;
- support for international agreements, legislation, administration, technical assistance, information exchange and education (102).

(b) Adverse Trade Implications

Countries are urged:

- to agree not to invoke environmental concerns as a pretext for discriminatory trade policies or for reduced access to markets or to transfer the burdens of environmental policies of industrialized countries to developing countries;
- to seek agreement in general that uniform environmental standards should not be expected to be applied universally by all countries with respect to given industrial processes or products, except in cases where environmental disruption may affect other countries (where disruption occurs because of incapacity of the local environment, more restrictive standards may be required);
- to seek worldwide harmonization of differences in product standards to encourage exports from developing countries;
- to establish environmental standards at levels necessary to safeguard the environment and not at levels directed towards gaining trade advantages;
- to maintain close watch on medium and long-term trends in international trade by promoting trade in natural products and commodities which compete with synthetics that have a greater capacity for pollution (103);
- to identify major threats to exports from developing countries arising from environmental concerns (104);
- to monitor, assess and report emergence of tariff and non-tariff barriers to trade as a result of environmental policies (105).

(c) Encouragement of Economic Opportunities

Developing countries were urged to seek economic advancement by considering:

- the new opportunities offered by industries in which a comparative advantage may be possible because of environmental considerations, and to take special care to apply appropriate international environmental standards to avoid pollution problems;
- the extent to which pollution problems could be ameliorated by reduction of current production levels;
- the growth of the production of synthetic products and substitutes which in their natural form could be produced by developing countries and review of the implications of environmental concerns in distribution of future industrial capacity, and assessing ways in which developing countries may take advantage of opportunities and minimize related risks (106).

Increased assistance was recommended in family planning programs (12), research into human reproduction (12), malnutrition (13), a fund for providing seed capital to strengthen settlements and housing programs (17), acquisition of information on soils (20), recycling of wastes (22), programs for preventing wasting of food (22), promotion and research of livestock management (23), strengthened international management of fisheries (50), and strengthened water management programs (53).

(d) Financing Environmental Action

The financial burden of environmental action was recognized by the conference recommendation that the preoccupation of developed countries with their own environmental problems should not affect the flow of assistance to developing countries, and that the flow should be adequate to meet the additional environmental requirements of such countries (109).

Programs relating to human settlements and developments should be strengthened (9), and mechanisms developed through the United Nations for financing international environmental action (107).

(e) International Exchange of Environmental Technologies

The governments and competent international organizations were advised to "keep a close watch on medium and long-term trends in international trade and take measures with a view to promoting:

(i) the exchange of environmental protection technologies, and

(ii) international trade in natural products and commodities which compete with synthetic products that have a greater capacity for pollution" (103).

Recognizing the need to promote integrated action in the planning and management of developing human settlements, governments were encouraged to exchange information on environmental technologies freely (20).

Implications for Ontario and Canada

DEVELOPMENT PLANNING

Because of Ontario's economic importance to Canada, the UN recommendations have great implications for Canada. Growth rates in Ontario are dependent upon rates of population increase and domestic economic conditions influenced largely by:

(a) federal policies relating to immigration and foreign investment;

(b) the considerable industrial base of the Province, established by comparative advantages, resource endowments, trade patterns and general development strategy, and its inherent momentum for further expansion;

(c) energy, resource and market availability;

(d) the attitude of the Ontario Government including the Province's administrative machinery to protect the environment in the face of advancing industrialization.

Significant aspects of these factors lie beyond the direct control of the Ontario Government. For example, the greatest area of uncertainty in forecasting future population is immigration. Immigration is important to Canada, and unless restricted, will continue to have a marked effect on population growth in larger Ontario cities.

With respect to the availability and use of resources notably energy, where provincial policies have a more direct impact, as consumption increases, the cost of pollution abatement per unit of energy consumed will likely become a more significant factor of production, and therefore price, and may affect the competitive position of industry. Thus, there are practical ramifications to the conservation of energy which could have significant effects on its future pricing and role in development planning.

Given these circumstances, pressures for continuing environmental disturbance will persist in many areas. Ameliorating action by the government requires increasingly sophisticated and costly environmental protection techniques and controls. As well, a variety of techniques involving economics and including extensive use of the price system will likely be needed to enforce more judicious resource use and reduce social costs.

One of the clear implications of these considerations for Ontario is the need for acceleration of planning measures (102) in its regional government program. The proposed impact assessment program, presently limited to the biophysical environment, should be gradually extended to include the human-social impact of a proposed action and be applied initially within those spheres influenced by government operations.

Where private and public planning has incorporated environmental impact assessment (102) and related controls, better environmental solutions to resource developments have begun to emerge. To date, however, the application of these requirements has been either sporadic or unsystematic and generally not applied to product development.

Where government and industry have been able to identify controls for specific pollutants or where consumer acceptance of a non-polluting product has been a factor, private enterprise has been able generally to develop methods of production which incorporate pollution control at competitive cost levels.

Unless a direct comparative advantage is apparent, however, there is little incentive to exceed minimum standards or to control pollutants that are not specifically regulated.

IMPLICATIONS ADVERSE TO TRADE

The Conference expressed opposition to any action by industrialized countries that would take advantage of the particular circumstances of developing countries and ultimately lead to environmental deterioration within "pollution havens" (103).

Further, the standards and requirements employed in Ontario have been set to safeguard the environment and not established with a view of gaining trade advantages. Where products such as detergents or automotive parts have been of significance in foreign and domestic trade, mutually acceptable and common international and national standards have been given consideration.

In anticipating that restrictions on trade or exports might develop because of environmental concerns or stricter standards, particularly in relation to exports from developing countries, the Conference recommended that trading partners be informed in advance and these threats be identified including their character and severity along with the remedial action envisaged (104).

This is of particular significance to Canada in relation to her generally more stringent environmental policies and may also apply to interprovincial trade in Canada where exports from less industrialized provinces could be threatened by environmental concerns e.g. phosphate materials produced in one province for detergent manufacture in another.

The United Nations would assist governments to develop acceptable common international environmental standards for products consid-

ered to be significant in foreign trade including standard testing and certification procedures designed to avoid arbitrary and discriminatory actions that might affect the trade of developing countries (104).

Where restrictions on trade do develop to the particular disadvantage of developing countries the Conference recommended that "appropriate measures for compensation should be worked out within the framework of existing contractual and institutional arrangements and any new such arrangements that can be worked out in the future."

An indication of the nature of the compensation was given in the recommendation that "assistance in meeting the consequences of stricter environmental standards might be given in the form of financial or technical assistance for research with a view to removing the obstacles that the products of the developing countries have encountered" (103d).

On the other hand, it is likely that competitive disadvantage for industries in Ontario will arise relative to management practices in other countries or provinces in an area of marginal comparative advantage or where (103) industry may not have to face certain costs for clean-up. For instance, it is doubtful whether some countries will require companies to pay forest protection and pollution control costs of the magnitude paid in Ontario.

In 1972, the United States Council on Environmental Quality forecast that until 1980, the annual effect on that country's balance of payments of increased pollution control costs would be negative and range from $2 to $3 billion.[30] The study assumed that other countries would not alter their existing standards, but observed that as these would likely be tightened in reality, the trading gap would be narrowed.

Standards for the industrialized parts of Canada and the United States are similar. It is doubtful that trade imbalances between the two countries caused by pollution would be significant.

Nevertheless, leads and lags in development of environmental standards among the industrialized nations will occur eventually leading to convergence of these standards and a diminution of the impact of differential standards. In the transition certain industries will gain and others lose. As it stands the most enduring differences in trade will likely be between the advanced and the developing nations.

POSITIVE ECONOMIC IMPLICATIONS

Without environmental regulations the full costs to society of producing goods are not reflected in prices of goods since society rather than the producer bears the costs of pollution. Regulation serves to "internalize" these costs by requiring producers to include them. As pollution-intensive goods incorporating these costs are produced, consumers will buy lower-cost goods, leading to the production of more low-pollution products.

The short-term effect of these changes can lead to adverse impact on society including job losses with little immediate relief because of new skill requirements, geography, and lack of knowledge of job opportunities. While these are real costs to society, the Council on Environmental Quality advised that they would not seriously threaten the long-term economic viability of the industries studied. Offsetting positive factors considered were increased profits and employment

(a) in the industries that produce pollution-abatement equipment and services,

(b) in the industries that produce relatively low-polluting products,

(c) for some firms in the industries affected by regulations that absorb the market shares held by inefficient and polluting firms that close when pollution abatement costs are incurred.

There is a growing awareness that heavy pollution need not accompany economic development. Very often, for new industry, among the traditional location factors—labour, political stability, raw materials, transportation, —environmental costs may not be so great or dictate location decisions.

Also, the political unpopularity of dirty multinational industries and the awareness of labour unions to possible exploitation of jobs will tend to discourage active pursuit of pollution havens. (Nevertheless, a case may be made for short-term assistance to industries where continued viability may in the long run be of greater social benefit to the community. This is reviewed in the section following on Financing Environmental Action.)

Where available environmental capacity exists (106b), especially among industrial countries where uniform environmental quality standards have begun to emerge, e.g. Canada-United States Agreement on Great Lakes Water Quality, to the extent this becomes a real factor of production such as labour, and capital, then a competitive effect may emerge. This would become a positive economic factor for the underdeveloped parts of the world (assuring acceptance of a basic international standard of environmental quality) where these locations may become significant in the distribution of future industrial capacity (106c).

FINANCING ENVIRONMENTAL ACTION

There is a need to appreciate how economic tools, constraints and considerations are important to the practical aspects of environmental management. In addition to environmental regu-

[30] *The Economic Impact of Pollution Control, United States. Council on Environmental Quality, March 1972.*

lation or effluent taxes, governments will need to further consider:

(a) economic regulation of pollution-intensive products, as in the anti-pollution devices now required on automobiles, the higher price reflects "third party" (external) costs and benefits.[31]

(b) increasing the prices of scarce resources (a strategic metal, for example,) to reduce consumption and stimulate exploration and research for additional supplies.

An example of where the price system might be used to "weight" social benefits and costs (a matter that is difficult to accomplish by administrative regulation) is the situation where people want to drive cars downtown. Though the drivers benefit, the presence of these vehicles in downtown areas adds to congestion and can create serious pollution costs to society at large. These problems could be reduced by charging persons (e.g. very high parking fees) for using their vehicles in places of congestion.[32] The only persons who would use their cars would be those who found this "privilege" important enough to pay the price charged.

The Government could also intervene, where necessary, with the determination of product selection by market forces in order to prevent the production and sale of products that do not meet environmental standards as has been done with federal legislation in controlling nutrient agents in cleaning compounds. Another example would be goods which cause noise in excess of acceptable levels.

Government may be able without regulation to condition the consumer and encourage product labelling and advertising to de-emphasize pollution-intensive products. This approach frequently needs the stabilizing effect of legislation which in turn leads to appropriate market adjustments.

Taxation or charges on parking or non-recyclable materials may be useful in pollution control. Taxation and user charges constitute an appropriate type of control device over a considerable range of circumstances. However, Ontario has found that regulation is often a more feasible means of controlling pollution in that it is as effective as taxation and user charges in its results, but is generally easier to administer and can give more predictable results.[33]

In addition, taxation and effluent charges might lead to government dependency on the revenue, and reluctance to alter a situation which produces this revenue. The need for a tax or charge is questioned if a polluter is required to install control equipment to ensure acceptable environmental quality.

Nevertheless, effluent charges or sewer-use rates have been used for control of high-strength waste discharges to municipal sewage systems. To be applied universally and effectively as an incentive to reduce discharge, effluent charges for each waste source would have to relate the amount paid to waste discharge behaviour directly and credibly (actual measurements).[34]

Experience in the State of Vermont with limited use of an effluent or emission charge for waste dischargers, unable to comply with compliance schedules, should be watched closely.

Government will also have to consider where it can obtain the greatest benefit for each dollar spent on environmental management. For instance, Toronto will experience a significant drop in nitrogen-oxides in the air when it effectively controls emissions from major industrial establishments. Thus, the marginal improvements in air quality in congested areas effected by the imposition of emission controls on cars might not be the most economical way to reduce nitrogen oxide content of the air.[35]

The Ontario Government has developed financing programs to assist municipalities in areas of high service costs for housing (17), water and sewage service (9), and recently has made funds available for undertaking regional waste management programs. A supply of federal and provincial funds has been earmarked over a five-year period for a specific restorative program in the Great Lakes. The problem of financing the clean-up of particularly "dirty" operations, notably industrial, often places governments in the position of having to make difficult choices among a variety of desirable social goals.

Nevertheless, if governments are to face the problems created by accelerated clean-up consistent with enacted regulations, some adjustment to assist in the amelioration of social costs, consequent upon the phasing out of environmentally-obsolete activities may be required. The acceleration of clean-up of the Great Lakes by Canada and the United States is a situation where this type of assistance might be useful to achieve compliance by the agreed target dates.

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[31] *In considering alternatives, costs should include both the dollars sacrificed as a price paid for a better environment as well as the cost of the pollution-abatement equipment.*

[32] *Reducing the number of cars in congested areas is perhaps the only feasible way, from an economic standpoint, of preventing serious pollution that sometimes occurs along downtown streets. Requiring extensive pollution-control equipment on automobiles to prevent this pollution would inflict a heavy cost on car owners who do not use their vehicles in these places.*

[33] *It would be difficult to predict the amount of pollution prevented by a given effluent charge. While an effluent charge or pollutant tax could be changed from its original level, this in turn could create an atmosphere of uncertainty to which adjustment by industry would be difficult.*

[34] *Evaluating Alternative Instruments of Water Quality Management. R.W. Judy, 20th Ontario Industrial Waste Conference, Toronto, June, 1973.*

[35] *A point will be reached where the adoption of additional measures will require further examination.*

In considering this problem, the Stockholm conference recommended an investigation of appropriate mechanisms for financing environmental programs (107).

As the demands for environmental assistance both external and internal will fall heavily on the federal and provincial governments, both levels should work in concert to formulate assistance programs in areas of need (109).

EXCHANGE OF CANADIAN ENVIRONMENTAL PROTECTION TECHNOLOGY

An excellent way in which industry could help to improve the global environment is to use the same high standards of pollution control in the developing nations as in the advanced nations. Pollution control is waste control. The newest, most efficient, industrial designs incorporate minimum waste and maximum product saleability, and are thus the most pollution-free and resource-conserving.[36]

Because Canada is one of the most technologically advanced nations on earth, Canadian Governments are endowed to disseminate technical information. They have a special responsibility to make industrial-environmental technology available to developing nations, especially where improved technology could facilitate exports and improve economic status, and so help them to fulfill their needs and improve the quality of human life within them.

Developmental and environmental technologies and scientific and management expertise, as well as financial program management, are well advanced in Ontario. The Government of Canada should be urged to co-ordinate the technological resources available in the provinces for external assistance.

Framework for Action in Ontario

A central recommendation of the Stockholm Conference concerned the adoption and use of environmental policies throughout the world using ways and means that would not impose an unacceptable burden on developing countries or regions. The developed nations were urged not to allow preoccupation with their own environmental problems to interfere with the flow of needed assistance to developing countries including assistance to meet additional environmental requirements of these countries.

This is a familiar problem both within Ontario and elsewhere in Canada where there is a great variation in development and industrial capacity. The residents of Ontario are therefore being called upon by the Conference to increase external assistance while the Government of Ontario pursues its own developmental goals within a broadening environmental framework.

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[36] *Industry Meeting on International Pollution Control Activities (E.P.A.), U.S. Department of Commerce, Washington, D.C., U.S.A., June 13, 1973.*

ENVIRONMENTAL IMPACT

Continuing pressures for disturbance of the environment in Ontario are expected because of factors related to population growth and industrial development. In this industrialized setting the attitude of Ontario citizens and of the government is one of the most significant factors in protecting the environment.

There are many opportunities for improving the use of resources, notably energy, to discourage waste and related increases in prices which will otherwise accrue to the disadvantage of industry and the greater community.

To promote more orderly use of energy and other resources, improvements in business and industrial promotion should be integrated with regional development and economic planning and zoning and implemented with a minimum of delay. The implementation of planning measures within the regional government framework and the government's proposed program for the advancement of planning of environmental protection should receive priority attention.

Multiple-use management concepts should be applied to production or development projects whereby a range of outputs of an activity could be examined in the light of environmental, social and economic effects. This evaluation could apply to an output from an entire industry, such as wood production by the forest industry, or to single governmental or industrial projects of significant magnitude.

With increasing costs for pollution control, requirements must be spelled out as clearly as possible so industry can make adequate provision for pollution control. Where uncertainty may exist because full knowledge of the environmental impact of a development is not available, e.g. the cooling water discharges from a power plant, either the proposal should be delayed until this knowledge is acquired, or flexibility should be built into the design to provide for the addition of control facilities as the need is demonstrated.

ENVIRONMENTAL COMPARATIVE ADVANTAGE

With the adoption of environmental standards, for example objectives or standards for the quality of water, a value may be assigned to the resource based upon its "carrying" capacity. This value may be positive or negative depending upon the standard and the levels of current or intended use.

Because of variations in the capacity of environments throughout the Province and elsewhere in Canada, the Province should undertake a systematic analysis of environmental comparative advantages throughout Ontario.

In developing industrial development strategies throughout the Province and elsewhere in Canada, the governments should undertake a full review of the practical implications of environmental concerns in relation to distribution of

future industrial capacity as well as ways in which the developing areas of Canada may be assisted to take advantage of opportunities and minimize environmental risks.

The Government should ease economic constraints which hinder the attainment of environmental goals. To encourage recycling, government could consider stabilizing the market for recyclable materials by taxing non-recyclable materials. The possibility of making limited use of effluent or emission charges on delinquent polluters should be examined as a pollution control incentive.

Government should be alert to possible negative aspects of existing taxation. For example, large depletion allowances for mining encourage the use of non-renewable minerals and discourage recycling of scrap material.

FINANCIAL ASSISTANCE TO INDUSTRIES WITH MARGINAL COMPARATIVE ADVANTAGE

Canadian governments must recognize the economic and social dislocations caused by the removal of pollution-intensive products from markets or the shutting down of pollution-intensive activities. This would require development assistance programs which would recognize the social costs of phase-out or shut-down and retraining and relocation of the affected manpower.

Canadian governments should fully examine appropriate institutional arrangements for financing accelerated environmental clean-up action in Canada and determine the impact of this financing on the future flow of Canadian assistance to developing countries.

EXCHANGE OF TECHNOLOGY

Canada should determine which institutions at the international level are best suited to undertake the monitoring of world trade trends as these are influenced by environmental protection policies and are suited to provide a forum for the exchange of this information and resolution of conflicts. Canada should then prepare a specific proposal on this matter to the United Nations for consideration.

The federal government should attempt to determine the extent to which current patent laws inhibit the free exchange of environmental protection technologies.

Organized reporting systems regarding innovations in environmental protection technologies should be considered by Canadian governments.

LAND USE AND ECONOMIC PLANNING

Land-use planning and control has a major impact on economic and regional development and should be co-ordinated with both economic planning and regional-development planning. In the past, important short-term considerations have required the sacrificing of objectives aimed at preservation of the resource base, as in the case of urban expansion into prime agricultural land. As land-use planners are often more concerned with maintaining a resource base for a particular purpose, the need for co-ordination in planning activities is clear.

INTERGOVERNMENTAL PLANNING IN CANADA

The economic interdependence between nations is paralleled by the same interdependence between the various Provinces and regions of Canada. This has implications for trade throughout Canada as trade may be affected by economic stability which is an essential element in strengthening environmental management programs.

In recognizing this, the Province should examine carefully environmental policies and programs in terms of their impact on present and future development potential of all parts of Canada; efforts should be made to reach interprovincial or national consensus on avoidance of discriminatory policies between provinces.

In terms of interprovincial trade in Canada, the Province of Ontario and all other provincial governments should identify "the major threats" to provincial exports, particularly those of the less industrialized provinces that arise from more restrictive environmental regulations elsewhere in Canada (caused by local factors including reduced carrying capacity of the environment).

The Government of Canada and certain of the Provinces because of developed capabilities, may be in a position to provide needed technical or other assistance to under-developed parts of the country in order that those responsible can adequately carry out their environmental obligations.

Specific proposals should be encouraged for an institutional framework within Canada capable of examining the adverse trade implications of environmental policies at both the international and interprovincial market levels. The concept could be expanded to include the more general economic impact of environmental policies, including their impact on income distribution and employment.

Chapter 4
PLANNING AND THE ENVIRONMENT

Ontario View of Principles

Principles 13 through 18 reaffirm the need to avoid adverse effects on the environment by an integration of planning efforts for the development of human settlements and resource undertakings.

More specifically, the principles refer to the following points:

- the need to protect and improve the human environment by a more rational management of resources through integration and co-ordination of development planning.
- the need for rational planning to resolve conflicts between development needs and environmental protection needs, and to obtain maximum social, economic and environmental benefits for human settlements and urbanization.
- the need for the application of demographic policies without prejudice to basic human rights to those regions where the rate of population growth or population concentrations are likely to have adverse effects on the environment or development, or where low population density may prevent improvement of the human environment and impede development.
- the need for an appropriate institution to be entrusted with the task of planning, managing, or controlling environmental resources to enhance environmental quality.
- the need for the application of science and technology to the identification, avoidance and control of environmental risks and the solution of environmental problems.

For the good of mankind and the peoples of Canada, the federal and provincial governments should integrate and co-ordinate all planning policies for development and environmental protection and enhancement, and extend technical and financial assistance to less developed countries.

Summary of U.N. Recommendations

The recommendations may be grouped into the following general categories:

REGIONAL PLANNING

The recommendations centre on the planning of human settlements, both urban and rural as an important means of improving the quality of human life while maintaining and enhancing environmental quality (1,4). Specific requests were made to the United Nations to increase research and assistance to governments in the fields of human reproduction, family planning (12), and malnutrition (13). Acceptance of an international fund to provide seed capital for housing (17), and the development of planning policies for rural areas (19) and for human settlements (4,15) were recommended. The incorporation of environmental impact assessment into project planning was recommended for development assistance projects.

NATURAL RESOURCE MANAGEMENT

Here, the Secretary-General of the United Nations and other international agencies and governments are called upon to initiate and participate in programs relating to the planning and management of natural resources.

The recommendations dealing with the establishment of physical inventories and monitoring systems include:

- Disaster warning networks (18), soil capability mapping (20), forest cover surveillance (25), systematic auditing of resource development projects (60), and monitoring of meteorological effects of resource developments (66).

Research and information exchange is called for in soil conservation (20), programs for integrated pest control (21,26), control of forest fires, pests and diseases (26), environmental effects of energy use and production (57,59), effects of mining and mineral processing (56), establishment of genetic resources conservation centres and reserves (43), and the development of techniques and institutions (51,54) for the integrated planning (63) and management (68) of natural resources (60).

DEVELOPMENT AND THE ENVIRONMENT

The recommendations in this area recognize the need for assistance to developing countries and regions including development of short and long-term plans to cope with major environmental problems leading to solutions of related administrative, technical and legal problems, information exchange, technical training and assistance (102).

The objective would be to advance towards sustained and balanced economic growth while preserving environmental and social values. Economic advancement would be sought through new industrial opportunities possible because of environmental comparative advantages. Recommendation 6 concerns the need for studies of the relationship between levels of industrial production and environmental quality.

International Assistance and Planning

HUMAN SETTLEMENTS

Canada has participated in the improvement of the quality of life in disadvantaged areas and settlements through support of a number of United Nations organizations and other international bodies including the World Health Organization (WHO), and the United Nations International Children's Emergency Fund (UNICEF).

Arrangements are presently underway for two major conferences: the Conference/Demonstration on Experimental Human Settlements to be hosted by Canada in 1976 which will allow development of information exchange in the field of urban research; and the World Population Conference which will consider planning requirements for the improvement of social and environmental conditions.

Canada also participates in a number of programs designed to provide warning of natural disasters, supports the programs of the World Meteorological Organization and participates in the "Pacific Tsunami Warning System."

NATURAL RESOURCE MANAGEMENT

Canada makes a major contribution to global resource management by its support and participation in the activities of the Food and Agricultural Organization of the United Nations (FAO). Response to some of the specific recommendations of Stockholm must await initiation of action by FAO and other United Nations organizations.

The International Joint Commission, under the terms of the Boundary Waters Treaty of 1909, provides an example of water-level planning and management between Canada and the United States. The International Joint Commission also monitors the governments' implementation of the Great Lakes Water Quality Agreement.

In addition, planning is implicit in a number of resource conventions (Fisheries, Wildlife, Whaling, etc.) and the work of international commissions on which Canada has representation. Also, Canada participates in the International Biological Program (IBP); Man and the Biosphere (MAB) program, the International Hydrologic Decade (IHD), and the Earth Resources Technology Satellite (ERTS) project.

DEVELOPMENT AND ENVIRONMENT

Canada is in a position to encourage various organizations such as the Organization for Economic and Cultural Development (OECD) and the North Atlantic Treaty Organization (NATO) in the preparation of regional plans and in the exchange of base-line information which will further the social and economic progress of less developed countries while minimizing adverse environmental effects.

Aid programs undertaken by the Canadian International Development Agency are presently subject to evaluation respecting environmental aspects as well as their administration, technical, and economic ramifications.

Implications for Ontario

OVERVIEW

Defined simply, planning is the process of preparing a set of decisions for action in the future, directed at achieving goals by optimal means. The necessity for planning arises from the probability that the future(s) which we desire are not likely to occur unless some conscious action is taken in the intervening period.

The achievement of a desirable level of environmental quality is dependent on abatement and prevention. Abatement is directed toward the reduction and elimination of pollution. Preventive strategy attempts to identify and resolve environmental problems as they emerge and before environmental damage occurs. Enhancement will lead to an improved environment.

Both the abatement and prevention processes presume the existence of environmental quality objectives and standards against which existing and proposed projects can be judged. Environmental planning consists of the process of developing objectives, standards and strategies designed to achieve desirable environmental quality through the abatement of existing pollution and the prevention of future environmental problems.

BALANCING CAPABILITY AND DESIRABILITY

Environmental planning essentially is the striking of a balance between capability and desirability. An environment is rated on the physical capability of its components and processes to sustain a development and maintain its quality. An environment may be highly rated for a development, but the development may not be socially or economically desirable there at the time. Development-siting decisions will be based on the carrying capacity of the environment consistent with the desired quality, and the social and economic desirability of the site at the time.

KEY PLANNING ISSUES

The relevance of this concept of environmental planning as a balancing process becomes apparent in considering the key planning issues with which government is currently grappling:

- economic growth versus the steady state economy—the degree of economic growth compatible with the maintenance or achievement of desired environmental quality is a central concern.
- limits on population growth in urban areas in the face of pressures to expand;
- the preservation of prime agricultural land for food production versus its potential for economically-profitable urban development;
- soaring energy demands versus a desire to conserve finite resources and protect fragile environments.

In each of these issues are conflicting interests which must be balanced. The Stockholm Conference recognized that the planning process is the appropriate means of striking such a balance and stated this in Principle 14 as follows: "Rational planning constitutes an essential task for reconciling any conflict between the needs of development and the need to protect or improve the environment."

THE USE OF LAND

Choices made in the use of land determine the environmental relationships. A decision to "use" the land implies alteration from its natural state. In the case of a site with multiple capabilities, the decision to exploit one often eliminates others. Therefore control is a fundamental method of achieving desirable objectives.

In Ontario, the Design for Development Program is the established mechanism for the elaboration of provincial and regional development strategies and the co-ordination of land-use policy. A hierarchy of plans is envisaged. Very broad objectives for development and environmental quality are to be established for the Province at large. Within this general context, development and environmental parameters are established for each of the five planning regions. These guidelines would include:

- the designation of growth centres and land-use patterns;
- the establishment of population targets;
- identification of appropriate resource development and economic growth objectives;
- environmental quality, conservation and recreation objectives to be reflected in land-use plans;
- proposed transportation and utility corridors.

At the regional and sub-regional levels, local governments will be responsible for the development of official plans consistent with the regional planning framework established by the Province. At each of these levels it is important that mechanisms are provided to ensure that planning for land-use includes the necessary accounting of environmental quality objectives and standards.

ENVIRONMENTAL ASSESSMENT

The Ontario Government has indicated its intention to proceed with the establishment of a comprehensive system of environmental assessment.[37] This measure will be an important factor in ensuring that public and private projects are in conformity with the environmental policy enunciated in provincial, regional and local land-use plans.

In addition to the need for mechanisms to ensure consistency between development strategy and environmental policy, there is a necessity for ensuring that individual projects or development proposals are consistent with land-use plans and the maintenance or achievement of established environmental quality standards.

At present, most private sector projects come under the purview of existing environmental approvals, permit or review procedures by which the particular environmental issues are examined individually. The proposed comprehensive system of environmental assessment would bring about an integrated consideration of the entire complex of environmental issues which might be generated by a given project.

This procedure should be applicable initially to projects in the public sector and progressively extended to encompass major projects in the private sector. The environmental assessment procedure should include an opportunity for public review of project alternatives; the participation of all affected provincial agencies; provision for the notification and participation of the public; procedures for public hearings and appeals.

DATA COLLECTION

Improvement of the quality of land-use decisions and project assessments depends in large part on the expansion of existing inventories of land capability and the accumulation of additional information on ecological processes and components.

Environmentally fragile areas and sites susceptible to physical hazards such as flooding, erosion, or land-slumping need to be identified and placed under appropriate land-use controls.

Monitoring of construction and post-construction impacts of various classes of projects in different ecological settings will increase ability to predict environmental effects and determine remedial action.

RESEARCH AND INFORMATION EXCHANGE

The Stockholm Conference recommended an international research effort in the development of methods for the integrated planning and management of natural resources. Research and information exchanges are also called for on several of the key planning issues mentioned above, including: environmental effects of mining and mineral processing; the management of energy resources; the relationship between industrial growth and environmental quality; and rural development policy. Ontario is in a position to both benefit from and contribute to this international accumulation and exchange of environmental knowledge.

The public is entitled to participate in decisions to ensure that the effects of development are beneficial. The importance of early public participation in the development of socially desirable projects must be assured to ensure that the most complete approach is taken to prevent measures adverse to the public interest while proceeding to secure support for measures which may lead to environmental enhancement.

Framework for Action

PLANNING AND MANAGEMENT OF RESOURCES

To improve conservation and management of renewable and non-renewable resources and further knowledge of the inter-relationships between these resources, the federal and provincial governments should develop or expand co-ordinated programs for the collection, measure-

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[37] *Speech From the Throne, Ontario Legislature—March 20, 1973.*

ment, analysis and exchange of data and information on the resource base.

The provincial government, for example, should where it has not already done so, initiate the development or expansion of water, soil and land capability inventories that could be used as references for all project development.

ENERGY

The federal government should undertake a continuing evaluation of available energy sources, new technology and consumption trends across the nation and elsewhere in the world to provide a basis for the establishment of policies jointly with the provinces concerning the utilization of energy resources. Research programs should be initiated on the development of new energy systems and determination of the best uses of existing ones.

NATURAL DISASTERS

The government should increase its research and monitoring programs to reinforce planning and management measures to reduce the impact of natural disasters and other physical hazards. The flood forecasting network operated by the Conservation Authorities Branch relies upon input from a large network of weather stations and stream gauges.

In addition, the Government is attempting to reduce the danger of natural disasters or hazards through the implementation of land-use policies which prohibit development in flood plains and coastal zones along the Great Lakes coastline or wherever unstable soil conditions exist.

FISHERIES

Because of the ever-increasing importance of fisheries to the world food supply and vulnerability of fisheries to adverse effects from various sources, it is essential that policies, plans, better management or other actions should be undertaken to protect and enhance aquatic resources. Ontario gives its full support and co-operation to the Great Lakes Fisheries Commission, and recognizes the need for an intensification and expansion of its work.

FOREST MANAGEMENT

It is the objective of the Government of Ontario to encourage management of forests for a multiplicity of purposes including timber production and the provision of forest land for outdoor recreation. Current planning provides for the identification and temporary reservation of areas where the recreational, historic, aesthetic and ecological values equal or exceed timber values.

Governments should further develop and promote the recognition that other uses of forests exist besides the production of timber. Plans for timber production should be subjected to assessment for environmental impact. The importance of forests and forest ecosystems should be incorporated into land and other resource-use planning.

WILDLIFE

Increasingly, environmental factors, including wildlife resources in habitat, are being studied as part of the land-use planning process. Where required, amendments should be made to encourage practices consistent with environmental objectives.

MINERAL DEVELOPMENT

Mineral development plans should be subject to analysis for environmental impact and provide for the conservation of mineral and other resources. To this end, the full range of management opportunities viewed within regional development strategies and land-use policies should be considered with provision for reclamation including suitable allowances for financing costs of restoration.

Pertinent land-use policies should provide for compatibility with concurrent uses and sequential development following rehabilitation. A site rehabilitation plan should be an essential part of the environmental assessment of mineral developments.

DEVELOPMENT OF ENVIRONMENTAL MANAGEMENT EDUCATION

Ontario educational institutions, particularly in the post-secondary area, are in process of adapting their curricula to provide increased opportunities for studies related to environmental management. Further research and data and personnel training are required in Canada to improve the planning and management of protected areas.

ECONOMIC AND SOCIAL OBJECTIVES

Planning of resource use should be directed towards improving contributions to specified objectives. It is essential that all plans for resource-use projects and programs clearly state the expected benefits and costs in terms of environmental, social and economic objectives. Proponents of an undertaking should describe the purposes of the proposed undertaking and provide an evaluation of the advantages and disadvantages direct and indirect of the proposal and its alternatives.

The short term social and economic problems caused by the phasing-out of environmentally obsolete industrial facilities should be met by the development of government policies and institutional arrangements for financing clean-up action or industrial relocation, and retraining and relocating the affected manpower. Planning for resource extraction should include provision for advanced planning for employee retraining and relocation where required to alleviate social problems associated with termination of the resource exploitation phase.

REGIONAL PLANNING

The Ontario Planning and Development Act is intended to promote a rational pattern of community development in the five provincial planning regions, consistent with maximum flexibility for future use.

The Design for Development Program is intended to consolidate objectives and policies of the provincial government ministries in each planning region and to ensure that the plans of regional and local municipalities are consistent with the achievement of provincially-articulated goals.

As a multiple-objective policy instrument, the development plan is intended to accord full consideration to social and environmental concerns and not be merely a plan for economic expansion. It should be understood that these goals may be fairly ambiguous, but will become more precise through development and refinement of actual plans.

Knowledge of existing conditions is a prerequisite for the formulation of sound plans. Studies to acquire this background knowledge should encompass not only the physical components and processes of the environment, but should also focus on the relevant social and economic factors. In order to assess better the current and possible future environmental situation, studies should be conducted periodically to determine the state of the environment and evaluate the major hazards to which it is likely to be exposed.

In under-developed regions these studies should include the effects of poverty, malnutrition, housing shortages, inadequate water supply and other social factors. Monitoring of environmental, social and economic parameters should be incorporated. The study should include consideration of conflicts between private and public interests in the use of the environment, together with an evaluation of institutions and planning methods for the solution of such conflicts.

Thus, in formulating strategies for development, governments should set goals and targets incorporating adequate food, housing, water supply and the progressive reduction and eventual elimination of poverty, and pollution.

PLANNING PRINCIPLES AND STANDARDS OR CRITERIA

Governments should develop planning principles and standards or criteria for the achievement of established environmental and social goals. The principles would provide the framework for planning while the standards would provide the uniformity and consistency needed for their attainment.

DEVELOPMENT AND THE ENVIRONMENT

There is need for continual research to increase man's knowledge of the capability of environmental components and processes to sustain development and the quality of the environment.

Development plans should be subject to review by the public as well as by all government ministries involved before decisions are reached with respect to such development.

CRITERIA AND STANDARDS FOR ENVIRONMENTAL QUALITY

Criteria and standards for environmental quality may vary from province to province, and governments should undertake to determine criteria for air and water quality and establish broad national ambient objectives for air and water. The governments should identify specific regions or watersheds of joint interest and establish ambient quality objectives or standards for these based upon the agreed criteria.

The water quality objectives of the intergovernmental agreement on Great Lakes Water Quality provide the reference framework upon which programs and other measures are being developed to achieve abatement and prevention of pollution throughout the Great Lakes Drainage System.

MONITORING OF AMBIENT AIR AND WATER QUALITY

Extensive monitoring of environmental pollutants is presently being carried out in Ontario jointly by the province and the federal government. There is a need to further co-ordinate these programs with the federal government, and develop new ones. Lack of co-ordination could result in diminishing the value of monitoring programs and baseline reference stations. Co-ordination of monitoring programs could ensure that environmental data are comparable between the provinces.

BASELINE EFFLUENT AND EMISSION REQUIREMENTS

The governments should co-operate in the development of national effluent and emission requirements for agreed-upon industrial classifications. Consideration should be given to the provision of a higher degree of co-ordination of existing and new programs and activities.

Chapter 5
INFORMATION/EDUCATION/RESEARCH

Ontario View of Principles

Principle 19 of the United Nations Declaration on the Human Environment states that, "Education in environmental matters for the younger generation as well as adults, giving due consideration to the underprivileged, is essential in order to broaden the basis for enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension. It is also essential that mass media of communications avoid contributing to the deterioration of the environment, but, on the contrary, disseminate information of an educational nature, on the need to protect and improve the environment in order to enable man to develop in every respect."

Ontario endorses this principle and fully recognizes that responsible conduct on the part of people of all ages stems from the enlightened opinion which education can provide. Educational institutions, scientific and professional groups, and the mass media all have a responsible role to play in this educational process.

Principle 20 of the Declaration states that, "Scientific research and development in the context of environmental problems, both national and multinational, must be promoted in all countries, especially the developing countries. In this connection, the free flow of up-to-date scientific information and transfer of experience must be supported and assisted, to facilitate the solution of environmental problems; environmental technologies should be made available to developing countries on terms which would encourage their wide dissemination without constituting an economic burden on the developing countries."

Principle 20 is likewise fully supported by the Province, and Ontario is carrying out a number of programs involving the sharing of information on health, human settlements, forest management, air, water, and soil pollution.

Summary of U.N. Recommendations

A considerable number of the Recommendations arising out of the Stockholm Conference refer to the Information/Education/Research theme. These recommendations may be summarized as follows:

INFORMATION

The countries of the world are urged to share, internationally, information on all environmental problems and solutions devised. This would include information on disaster warnings (18), soil capabilities and uses (20), effects of climatic, economic and social factors on soil degradation, including payment of inadequate prices for agricultural products from developing countries (20); integrated pest control (21); research into forest fires, pests and diseases (26), forests and forest management (24), genetic resources (39), particularly endangered by depletion or extinction (45); pollution research and control, and technology (52); water management (52), mining and mineral processing (56); energy (58); marine research (41); pollutant pathways and risks (73); effects of pollutants on health (74), the production, transport and use of marine pollutants (89), and related warning systems (76); and criteria for food (82). Information programs should be designed to create awareness of environmental issues (97). Facilities should be established for the exchange of information and experience between less industrialized countries which have similar problems as a result of common physical and climatic conditions including assistance in the preparation of national reports on the environment (95). Governments are encouraged to keep close watch on trade trends and promote the exchange of environmental protection technologies and related trade policies and practices (103).

EDUCATION

An international program should be established in environmental education, interdisciplinary in approach, carried out in school and out of school (19, 96, 102), and directed towards the general public, youth and adult alike. Responsibility for the assessment of educational requirements in their areas is left with those responsible for education (8). Specific reference is made in the recommendations to the necessity of training people in pre-disaster planning and precautions (18), planning, development and management of human settlements (6, 10, 16) in the environmental aspects of forest management (24) and wildlife management (31), including parks and protected areas (34, 35) particularly in developing countries (1). Governments and the United Nations are urged to provide equal possibilities for everyone through training and access to information to influence their own environment (7, 96).

RESEARCH

Over-all responsibility for environmental research at the international level should be vested in a central body (4). The U.N. recommendations stress the importance of governments arranging for exchange visits by researchers and exchange of research findings from both public and private institutions (5).

It is further recommended that U.N. bodies support government action in research, training and information on droughts (18), natural disaster research (18), soils, their use and degradation (20), inland water pollution and water manage-

ment (52, 53) and that financial support be secured to increase the capacity of developing countries to participate in international marine research and pollution control programs (91).

Implications for Ontario

Knowledge of the environment, and the basic part it plays in human life, should be the goal of all education. From their earliest days, children should be taught awareness of the natural interrelationships essential to human life, and the promotion of harmony between them. Lack of awareness has resulted in a significant waste of resources, and damage to the environment in the rapid urbanization of Ontario. People of all ages should be educated to awareness of their environment and enhancement of its quality.

To be effective, educational programs must include all segments of society. There is sufficient evidence of deterioration in environmental quality in many areas of the Province to indicate a need for a more comprehensive approach than has been effected in the past. The responsibility for wider dissemination of information lies with many agents normally considered to be outside the formal educational system. Scientific and professional groups, for example, could convey the findings of research in language that is clear to the general public.

The media have a responsibility to provide accurate and current information. In a society where the individual is given a great deal of choice in life styles, it should be possible to secure the greatest degree of help and cooperation in the correction of past mistakes and the safeguarding of future environments. This can be done only if citizens are aware of the consequences of their decisions.

Ontario has been involved for a number of years in the type of educational programs outlined above. Curriculum guidelines published by the Ministry of Education in Ontario encourage teachers to develop studies of environmental issues in local, provincial, national and international contexts.

Most universities in Ontario and virtually all Colleges of Applied Arts and Technology have had for many years ongoing, interdisciplinary programs concerned with the environment. At least four universities and ten colleges now offer full-time programs in Natural Resources, Environmental Control, Forestry, Fish and Wildlife, Community Planning and Development.

Several schools, colleges and universities are active in the Province in the training of students of urban development and in providing training courses in the planning of human settlements (16). But there is an urgent need for training in the management of human settlements. With the marked growth in urban areas of multiple housing forms (apartments, townhouses, condominiums) the need for professional managers in both public and private sectors is urgent.

Generally, the demand for jobs in the environmental field outstrips the numbers of jobs available. While governments have taken the lead in the development of vocations in the field, further encouragement should be given to public and private investment in jobs for graduates, and personnel trained in environmental skills.

In the field of agricultural training, as it relates to environmental concerns (19), the Ontario Ministry of Agriculture and Food has established five colleges of agricultural technology in the Province, and a diploma course at the University of Guelph to provide post-secondary school agricultural training for students expecting to enter primary and secondary agricultural businesses such as feed companies, slaughter houses, machinery manufacturing and sales.

Training courses in wildlife management and the management of parks and protected areas (31, 34) are available, and the Ministry of Natural Resources provides contact field training for representatives of other countries. In general, however, groups seeking this training have been small and too little time has been available to make a significant impact on them.

It is desirable for Ontario to more actively promote these courses as well as to encourage use of the training facilities available at the former Ontario Forest Technical School. In addition, a closer liaison should be worked out with developing countries interested in this training program to ensure that those taking such training could apply their new knowledge directly in the field. Cultural barriers sometimes preclude the trainee entering into the actual field work when he returns to his own country.

Consideration should be given, perhaps, to the creation of instructional groups which would visit a particular country to analyse the problems and, subsequently, to instruct in that country, using advanced management techniques, at the same time working within the country's cultural restraints.

The Province has been engaged, as well, in co-operative educational programs with other countries (95, 96). For example, the Ministry of Education has been involved for some years in the twinning of schools between Ontario and Commonwealth Caribbean countries. The project (which has been related to all aspects of school programs and not to environmental studies alone) has included as well the provision of school equipment, books and supplies.

In general, it is felt that education on environmental matters should be an integral part of all technical disciplines. Better communication should be developed, as well, among agencies having responsibilities in the environmental protection field in order that available expertise may be utilized.

The Province of Ontario is willing to share its environmental technology as well as its environmental planning philosophy (102) with other

countries. Possessing technical expertise capable of dealing with most air, water and soil problems, the Province can assist other countries in training programs which will enable them to develop their own technical capabilities.

With reference to the Stockholm recommendations concerning research and development, the Province has been promoting such programs in the environmental field for many years by means of in-house and contracted projects concerned with the prevention or abatement of the pollution of air, water and soil. Reports on these projects are available and have been widely distributed to those interested or have been published in well-known journals (84, 100).

Staff of the Ministry of the Environment and those conducting contract work have discussed their projects at seminars and conferences in a general exchange of research information. Methods and associated analytical developments of research projects dealing with water and waste treatment have been explained and demonstrated to visitors and students from other countries.

Through the efforts of the Canadian International Development Agency and the World Health Organization, Ministry of Environment staff have, on occasion, been loaned to Caribbean countries to assist them in adapting known analytical methods to their local conditions and capabilities (53). In addition, these countries continue to send their personnel for training in the Ministry's laboratories. Participation in the work being conducted for the International Hydrologic Decade also contributes to the sharing of data and expertise.

The Ontario Housing Corporation actively carries out research in the area of human settlements and arranges for the exchange of its research findings with other agencies involved in similar programs (4, 5).

With reference to research into human health problems, and particularly the effects of environmental agents on the health of people (26, 74), it is agreed that the major responsibility in this field should rest with an official health agency guided by the World Health Organization.

Ontario does, however, have a special agency (the Environmental Health Effects Service within the Ministry of Health) which is engaged in long-term studies of the effects of environmental agents on the health of people—including chronic toxicity, mutagenic, teratogenic and carcinogenic effects. While this program is well advanced, it could profit by the availability of funds for contract research and short-term directed research programs as environmental health questions arise.

Considerable work has been done in the Province in monitoring waste material or toxicants being discharged into the environment and this information could be valuable to other governments which do not have the capability of undertaking such monitoring and study programs.

Insofar as research into forestry matters is concerned, (26) the Province of Ontario has been involved, both locally and in co-operation with other provinces, in programs concerned with research and information exchange on forest fires, pests and diseases. The program includes data collection and dissemination, identification of potentially hazardous areas, research into pest control, the influence of forest fires on ecosystems and their impact on resource management.

It is recommended that an organization be formed to make aircraft, water bombers and crop sprayers available on an international basis for fighting forest fires and for pest control.

It is suggested that a more co-ordinated environmental research program be arranged between the federal and provincial agencies and that more funds be directed into such research programs as those outlined above. An example of such is the research program contained in the Canada-Ontario Agreement on Great Lakes Water Quality, the cost of which is shared between the governments.

The need for constant exchange of information on environmental matters as well as information access is fully recognized (7, 97). For a number of years, the Government of Ontario has carried out a concentrated educational and information program in this area. The program is designed to acquaint the citizens of this Province with the environmental protection programs which are being undertaken on their behalf as well as to elicit their support of these programs so that through personal involvement they may influence their own environment.

With reference to the exchange of information and experience with less industrialized countries (102e), the Government of Ontario has established an inventory of the major environmental problems faced by the Province and has the technical expertise capable of dealing with most of them. The Province is in a position, therefore, to provide such resource material to other countries.

The distribution of warnings through observational and communications networks (18) is also part of the Province's information exchange program. Flood forecasting is undertaken by the Ministry of Natural Resources, with the operation of a large number of flood control dams and reservoirs throughout the Province being an integral part of this forecasting program. Flood warnings are issued by telephone direct to municipal agencies responsible for flood protection measures and by radio and television to the general public.

The Province of Ontario's policy of information exchange includes, as well, the sharing of knowledge and the transfer of experience on soil capabilities (20). This exchange takes place through learned societies, personal contacts and student exchange. For example, the University of Guelph,

supported by the Ministry of Agriculture and Food, has an active exchange program with the University of Ghana.

Similarly, the transfer of information on forest and national parks management is undertaken by the Ministry of Natural Resources (27, 35). A considerable exchange of data takes place with other countries where conditions are similar or techniques applicable.

The Ministry of the Environment has prepared a number of reports dealing with environmental problems related to mining and mineral processing (56). These reports would be a valuable addition to a co-ordinated international library on this subject (101). The Ministry has formulated guidelines which will be useful in solving many of the environmental problems troubling the mining industry. Other valuable information is available from the Ministry of Natural Resources which has prepared and published various geological maps and studies on mineral resources and mineral processing.

A considerable exchange of information is conducted among municipal utilities and agencies on energy, through the participation of staff in meetings and conferences and through the publication of papers and reports (58). Access to the existing body of information needs to be facilitated and research on different energy systems needs to be expanded.

With respect to the exchange of information on experience, methods and work in progress, in connection with the human benefits of environmental developments (95c), information gathered in the field by the Ontario Ministry of Community and Social Services, through its program implementation is forwarded to the Intergovernmental Committee on Urban and Regional Research. The Committee's services are, in turn, used by that Ministry as well as by other agencies within the Government. This Committee could be utilized as a vehicle for the flow of information to all provinces and to the Federal Government as the data becomes available.

In this way, all interested levels of Government can draw information relating to the formation of programs for environmental education, the exchange of ideas and the formation of community action programs. Information supplied through this Committee could also be of considerable help in the development of social and cultural indicators for the environment (95d).

Ontario with its rapidly expanding metropolitan area is dealing presently with particular problems which generate specific data, and this data would be of utmost importance in the formation of social and cultural indicators. Such information would be of particular value to all those involved in any sort of community planning.

In general, the Government of Ontario supports the broad principles contained in the Stockholm recommendations with respect to information exchange, education and research and would be willing to expand its present programs under which it shares its environmental expertise and information with other countries.

Framework for Action in Ontario and Canada

INFORMATION

- The governments in Canada at the federal and provincial levels should undertake or in some cases strengthen the necessary organizations to insure the collection and exchange of information within the country on all matters related to the quality of the environment especially in the areas of planning and management of human settlements and the educational, social and cultural aspects of environmental issues.
- The Government of Canada is in a favourable position to gather information and develop awareness of developments abroad in environmental matters, to maintain formal and informal contacts with other countries and to disseminate information to the provinces and industrial bodies.
- Before proceeding with major development projects, the governments concerned should arrange for the public to participate in decisions and ensure that the effects of development are beneficial.
- The governments should, through regulation of hazardous substances, control products which may have an adverse effect on the quality of the environment, and communicate the necessary information to the public.

EDUCATION

- Canada should actively support the developing countries on matters pertaining to the education of people, particularly at the elementary level.
- For higher levels of education, Canadian programs for assistance to developing countries should preferably involve sending Canadian teachers and experts to participate in the school systems of developing countries rather than limiting assistance to invitations to students to come to Canada.
- The Province of Ontario should encourage environmental education by the integration of environmental themes into the total curriculum and by the introduction of specific units and specific courses at appropriate levels in school programs. Both approaches can be effective where the teaching staff has adequate knowledge of the relationships between man, energy and nature.
- Governments in Canada require more professionals with expertise in ecology to meet the

requirements of today's complex social problems, and with particular reference to protection of the environment.

- The mass media systems across Canada should be encouraged to participate in the extra-mural education of citizens in the benefits of a better human environment.

RESEARCH

- The governments in Canada should increase their funding of research related to the quality of the environment. This applies to basic research as well as to the research carried out to improve technology and new-process development.
- Active support should be given to research of substitutes for products or goods that have a detrimental effect on the environment.
- Increased consideration should be given by governments and centres of research to furthering studies in related areas of ecology.
- Research should be intensified at all levels of government to improve the planning and management of the development of Canadian cities to enhance the quality of life.
- Intensive research is required to evaluate pathways and risks to health of contaminants and environmental hazards.

Chapter 6
RESPONSIBILITIES OF STATES

Ontario View of Principles

The Stockholm principles 21-26 proclaim the rights of States in the protection of the environment, and outline their responsibilities to one another.

Principle 21 states that, "States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction."

In Principle 22 it proclaimed that, "States shall co-operate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction."

In Principle 23 it states that, "Without prejudice to such criteria as may be agreed upon by the international community, or to standards which will have to be determined nationally, it will be essential in all cases to consider the systems of values prevailing in each country, and the extent of the applicability of standards which are valid for the most advanced countries but which may be inappropriate and of unwarranted social cost for the developing countries."

In Principle 24 the Conference proclaimed that, "International matters concerning the protection and improvement of the environment should be handled in a co-operative spirit by all countries, big or small, on a equal footing. Co-operation through multilateral or bilateral arrangements or other appropriate means is essential to effectively control, prevent, reduce and eliminate adverse environmental effects resulting from activities conducted in all spheres, in such a way that due account is taken of the sovereignty and interests of all States."

And in Principle 25 that, "States shall ensure that international organizations play a co-ordinated, efficient and dynamic role for the protection and improvement of the environment."

Principle 26 proclaims, "Man and his environment must be spared the effects of nuclear weapons and all other means of mass destruction. States must strive to reach prompt agreement, in the relevant international organs, on the elimination and complete destruction of such weapons."

Principles 21-26 stress the essential need for international co-operation in the protection and improvement of the natural environment as well as the need to support the co-ordinating role of international agencies.

These principles relate specific responsibilities to individual States for their behaviour within the international community. Principles 21 and 22, while maintaining the rights of States to exploit their natural resources, call for the assumption of liability and the payment of compensation for adverse effects of such exploitation beyond national jurisdictions.

The principles also recognize disparities in capability between so-called advanced and developing countries, and that national environmental standards must be appropriate to the level of development of individual nations.

Summary of U.N. Recommendations

While the majority of the recommendations emanating from the Stockholm Conference relating to Principles 21-26 are directed to the United Nations or its agencies, a number bear directly on the responsibilities of States in regard to their relationships within the international community. These recommendations may be considered under the categories of International Programs, Conferences and Conventions, and Consultation and Co-operation.

INTERNATIONAL PROGRAMS

Recommendations 2, 7, 8, 10, 15, 16, 18, 19, 23, 43, 45, 46, 49, 52, 66, 67, 68, 74, 75, 79, 85, and 87 provide for the establishment and/or support of international environmental improvement programs. These programs, largely co-ordinated by various U.N. agencies, call upon individual governments to support the implementation of measures to improve the quality of life, to encourage the conservation and management of resources, and to increase our understanding of environmental relationships.

CONFERENCES AND CONVENTIONS

Recommendations 14, 32, 33, 38, 47, 81, 82, 86, 98 and 99 call upon nations to accept responsibility for developing and supporting conventions and treaties appropriate to the protection and improvement of the world environment. Of special importance is the need to recognize responsibility for internationally-shared resources and to ensure that benefits accruing from such resources are equitably shared by all.

CONSULTATION AND CO-OPERATION

Recommendations 3, 37, 48, 50, 51, 65, 70, 72 and 103 recognize that international programs, conferences and conventions can only result from nations assuming responsibility for consulting on mutual problems and goals and co-operating to achieve their solution.

Such consultations should recognize not only shared-resource situations but also the spill-over effect of national developments beyond areas of

national jurisdiction, i.e. the recognition of 'global' responsibilities and acknowledgement that the environment transcends man-made boundaries.

Implications for Ontario

In so far as adoption of principles 21-26 will result in a heightened awareness of the need for increased co-operation and consultation on environmental and resource developments among members of the international community, the Province of Ontario fully supports their implementation.

In addition such support entails the maintenance by Canada of adequate membership and active participation in U.N. agencies as well as the strengthening of the means for consultation among all states to ensure proper attention to the environmental aspects of international relations to meet the objectives of these principles.

Principles 21-26 however, also have important implications for the management of Ontario's external activities and the conduct of federal-provincial relations within the Canadian federal system.

THE MANAGEMENT OF THE EXTERNAL ACTIVITIES OF THE PROVINCE OF ONTARIO

Principles 21-26 are primarily concerned with international relations respecting environmental matters. International relations is an area where both levels of government have legitimate interests and where co-operation is essential for each to attain its policy objectives.

Since environmental matters under the British North America Act are primarily a provincial responsibility, Ontario has a vital interest in international matters which may affect this responsibility.

Foreign policy and the treaty-making power have been and remain the sole responsibility of the federal government. This does not in itself preclude the participation of the Canadian provinces in Canada's international relations. The complexities of modern interstate relations involve a great number of contacts and exchanges in substantive areas which in Canada come under the jurisdiction of the provinces.

It is only natural that the implementation in Canada of decisions made in the context of international relations which affect these areas requires the active co-operation and often the formal agreement of the provinces. An excellent example of this is the well developed co-operative programs which exist between the United States and Canada, at all levels of government, on Great Lakes air and water quality matters.

In addition, the provinces have a genuine interest in maintaining adequate knowledge of developments in their areas of jurisdiction which take place elsewhere. Finally, the nature of international relations itself is changing. Whereas a few decades ago most international relations were conducted on a bilateral basis, a number of special purpose multinational associations have been created in recent years.

In many instances, the areas of interest of these associations fall wholly or partly within the jurisdiction of the provinces and a realistic Canadian representation on these associations must take account of this fact.

Since environmental matters are primarily a matter of provincial jurisdiction, it is in the interest of the Province of Ontario:

(a) to be aware of developments abroad in the environmental area and thus to maintain informal and formal contacts with other jurisdictions;

(b) to be consulted in such instances where agreements or conventions entered into by the Government of Canada affect our environmental responsibilities and to participate in Canadian representation to these conventions or agreements.

FEDERAL-PROVINCIAL RELATIONS

Environmental management in Canada has particularly difficult dimensions because of the jurisdictional complexity concerning these matters in our federal system. However, under the British North America Act, environmental management is primarily a provincial responsibility and jurisdictional complexity should not be assumed to necessitate the transfer of responsibility for environmental matters to larger units of government or that national programs represent a viable solution to all environmental problems.

While environmental management as a subject is not specifically mentioned in the British North America Act, governments in Canada have nevertheless dealt with various aspects of environmental management through specific powers assigned to them under the constitution. The following lists illustrate the great extent of the powers which can be drawn upon by governments to meet environmental management problems.

At present, the provincial authority over property and civil rights in the province (92:13), local works and undertakings (92:10), agriculture (95), as well as ownership of natural resources within provincial boundaries (92:5) confer considerable authority on provincial governments to act in the area of environmental management.

Federal power to act in this area stems from the criminal power (91:27), the spending power, and possibly the peace, order, and good government clause (91) as well as from specific subject headings in the British North America Act over which it has constitutional authority, e.g. shipping and navigation (91:10), sea coast and inland fisheries (91:12), agriculture (95), extra-provincial undertakings (92:10 (a,b,c,), territories, and international relations in areas under its exclusive jurisdiction.

Environmental management requires the employment of both planning and regulatory strategies. On the one hand, programs of regional planning and development concerning land use, zoning, housing, local transport, water supply and sewage treatment are considered basic provincial responsibilities which can be most effectively planned and applied at the provincial and local levels.

Federal activities and responsibilities which have a direct impact on these matters should complement, and be supportive of, provincial plans. On the other hand, the international promotion of Canada's environmental objectives and responsibilities as well as the defense of the Canadian environment from international pollution hazards require the action of the Federal government.

The recognition that all levels of government in Canada have important responsibilities to manage the environment has fostered the development of a variety of intergovernmental mechanisms to ensure the development and implementation of sound environmental programs.

Through co-ordinated and co-operative programs on such matters as ambient environmental quality criteria, objectives and standards, national baseline pollution control requirements for industry, pollution control implementation, monitoring and surveillance, contingency plans, research, technical advice and training, as well as cost-sharing and administration, governments in Canada will help to ensure that our individual and collective environmental goals will be most effectively achieved.

Framework for Action

The federal and provincial governments have a heavy responsibility, within their respective areas of jurisdiction, to guide the nation's industrial and social activities in such a way as to maintain a healthy and attractive environment for the benefit of present and future generations.

Recognizing the need for increased co-operation between nations in the field of environmental management and assistance, the governments in Canada should commence to develop jointly, plans and strategies for improving environmental programs within Canada together with support for and assistance to international agencies, including those of the United Nations, whose function is to bring about the maximum social, economic and technological betterment of lesser developed countries.

Such assistance must be rendered at a minimum environmental cost. In addition, programs should be implemented by the governments which will result in a greater exchange of information and of research findings concerning the natural environment and man's use of it.

In this connection, the governments should intensify the means by which they are kept aware of developments abroad in the environmental area, maintaining both formal and informal contacts with other jurisdictions.

In view of the finite nature of many of our resources, new emphasis should be placed on the wise use and conservation of resources in order to obtain the greatest possible benefit for the Canadian people. Renewable resources should be so managed as to increase productivity while at the same time maintaining diversity.

Recognizing that all levels of government in Canada have specific responsibilities in the field of environmental management, mechanisms should be developed to avoid repetition, and to ensure the development and implementation of sound environmental programs, with a minimum of overlapping responsibilities.

A good example of such a mechanism is seen in the proposal for an accord between the federal and provincial governments whereby their resources would be brought together in complementary environmental programs, with each government acting within its own jurisdiction.

Appendix 1

DECLARATION OF THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT

DECLARATION OF THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT

The United Nations Conference on the Human Environment,

Having met at Stockholm from 5 to 16 June 1972,

Having Considered the need for a common outlook and for common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment,

Proclaims that:

1. Man is both creature and moulder of his environment, which gives him physical sustenance and affords him the opportunity for intellectual, moral, social and spiritual growth. In the long and tortuous evolution of the human race on this planet a stage has been reached when, through the rapid acceleration of science and technology, man has acquired the power to transform his environment in countless ways and on an unprecedented scale. Both aspects of man's environment, the natural and the man-made, are essential to his well-being and to the enjoyment of basic human rights—even the right to life itself.

2. The protection and improvement of the human environment is a major issue which affects the well-being of peoples and economic development throughout the world; it is the urgent desire of the peoples of the whole world and the duty of all Governments.

3. Man has constantly to sum up experience and go on discovering, inventing, creating and advancing. In our time, man's capability to transform his surroundings, if used wisely, can bring to all peoples the benefits of development and the opportunity to enhance the quality of life. Wrongly or heedlessly applied, the same power can do incalculable harm to human beings and the human environment. We see around us growing evidence of man-made harm in many regions of the earth: dangerous levels of pollution in water, air, earth and living beings; major and undesirable disturbances to the ecological balance of the biosphere; destruction and depletion of irreplaceable resources; and gross deficiencies harmful to the physical, mental and social health of man, in the man-made environment, particularly in the living and working environment.

4. In the developinq countries most of the environmental problems are caused by under-development. Millions continue to live far below the minimum levels required for a decent human existence, deprived of adequate food and clothing, shelter and education, health and sanitation. Therefore, the developing countries must direct their efforts to development, bearing in mind their priorities and the need to safeguard and improve the environment. For the same purpose, the industrialized countries should make efforts to reduce the gap between themselves and the developing countries. In the industrialized countries, environmental problems are generally related to industrialization and technological development.

5. The natural growth of population continuously presents problems on the preservation of the environment, and adequate policies and measures should be adopted, as appropriate, to face these problems. Of all things in the world, people are the most precious. It is the people that propel social progress, create social wealth, develop science and technology and, through their hard work, continuously transform the human environment. Along with social progress and the advance of production, science and technology, the capability of man to improve the environment increases with each passing day.

6. A point has been reached in history when we must shape our actions throughout the world with a more prudent care for their environmental consequences. Through ignorance or indifference we can do massive and irreversible harm to the earthly environment on which our life and well-being depend. Conversely, through fuller knowledge and wiser action, we can achieve for ourselves and our posterity a better life in an environment more in keeping with human needs and hopes. There are broad vistas for the enhancement of environmental quality and the creation of a good life. What is needed is an enthusiastic but calm state of mind and intense but orderly work. For the purpose of attaining freedom in the world of nature, man must use knowledge to build, in collaboration with nature, a better environment. To defend and improve the human environment for present and future generations has become an imperative goal for mankind—a goal to be pursued together with, and in harmony with, the established and fundamental goals of peace and of world-wide economic and social development.

7. To achieve this environmental goal will demand the acceptance of responsibility by citizens and communities and by enterprises and institutions at every level, all sharing equitably in common efforts. Individuals in all walks of life as well as organizations in many fields, by their values and the sum of their

actions, will shape the world environment of the future. Local and national governments will bear the greatest burden for large-scale environmental policy and action within their jurisdictions. International co-operation is also needed in order to raise resources to support the developing countries in carrying out their responsibilities in this field. A growing class of environmental problems, because they are regional or global in extent or because they affect the common international realm, will require extensive co-operation among nations and action by international organizations in the common interest. The Conference calls upon Governments and peoples to exert common efforts for the preservation and improvement of the human environment, for the benefit of all the people and for their posterity.

States the common conviction that:

PRINCIPLE 1

Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations. In this respect, policies promoting or perpetuating apartheid, racial segregation, discrimination, colonial and other forms of oppression and foreign domination stand condemned and must be eliminated.

PRINCIPLE 2

The natural resources of the earth including the air, water, land, flora and fauna and especially representative samples of natural ecosystems must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate.

PRINCIPLE 3

The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved.

PRINCIPLE 4

Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat which are now gravely imperilled by a combination of adverse factors. Nature conservation including wildlife must therefore receive importance in planning for economic development.

PRINCIPLE 5

The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to ensure that benefits from such employment are shared by all mankind.

PRINCIPLE 6

The discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems. The just struggle of the peoples of all countries against pollution should be supported.

PRINCIPLE 7

States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

PRINCIPLE 8

Economic and social development is essential for ensuring a favourable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life.

PRINCIPLE 9

Environmental deficiences generated by the conditions of underdevelopment and natural disasters pose grave problems and can best be remedied by accelerated development through the transfer of substantial quantities of financial and technological assistance as a supplement to the domestic effort of the developing countries and such timely assistance as may be required.

PRINCIPLE 10

For the developing countries, stability of prices and adequate earninqs for primary commodities and raw material are essential to environmental management since economic factors as well as ecological processes must be taken into account.

PRINCIPLE 11

The environmental policies of all States should enhance and not adversely affect the present or future development potential of developing countries, nor should they hamper the attainment of better

living conditions for all, and appropriate steps should be taken by States and international organizations with a view to reaching agreement on meeting the possible national and international economic consequences resulting from the application of environmental measures.

PRINCIPLE 12

Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and any costs which may emanate from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose.

PRINCIPLE 13

In order to achieve a more rational management of resources and thus to improve the environment, States should adopt an integrated and co-ordinated approach to their development planning so as to ensure that development is compatible with the need to protect and improve the human environment for the benefit of their population.

PRINCIPLE 14

Rational planning constitutes an essential tool for reconciling any conflict between the needs of development and the need to protect and improve the environment.

PRINCIPLE 15

Planning must be applied to human settlements and urbanization with a view to avoiding adverse effects on the environment and obtaining maximum social, economic and environmental benefits for all. In this respect projects which are designed for colonialist and racist domination must be abandoned.

PRINCIPLE 16

Demographic policies, which are without prejudice to basic human rights and which are deemed appropriate by Governments concerned, should be applied in those regions where the rate of population growth or excessive population concentrations are likely to have adverse effects on the environment or development, or where low population density may prevent improvement of the human environment and impede development.

PRINCIPLE 17

Appropriate national institutions must be entrusted with the task of planning, managing or controlling the environmental resources of States with the view to enhancing environmental quality.

PRINCIPLE 18

Science and technology, as part of their contribution to economic and social development, must be applied to the identification, avoidance and control of environmental risks and the solution of environmental problems and for the common good of mankind.

PRINCIPLE 19

Education in environmental matters, for the younger generation as well as adults, giving due consideration to the underprivileged, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension. It is also essential that mass media of communications avoid contributing to the deterioration of the environment, but, on the contrary, disseminate information of an educational nature, on the need to protect and improve the environment in order to enable man to develop in every respect.

PRINCIPLE 20

Scientific research and development in the context of environmental problems, both national and multinational, must be promoted in all countries, especially the developing countries. In this connection, the free flow of up-to-date scientific information and transfer of experience must be supported and assisted, to facilitate the solution of environmental problems; environmental technologies should be made available to developing countries on terms which would encourage their wide dissemination without constituting an economic burden on the developing countries.

PRINCIPLE 21

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

PRINCIPLE 22

States shall co-operate to develop further the international law regarding liability and compensation

for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction.

PRINCIPLE 23

Without prejudice to such criteria as may be agreed upon by the international community, or to standards which will have to be determined nationally, it will be essential in all cases to consider the systems of values prevailing in each country, and the extent of the applicability of standards which are valid for the most advanced countries but which may be inappropriate and of unwarranted social cost for the developing countries.

PRINCIPLE 24

International matters concerning the protection and improvement of the environment should be handled in a co-operative spirit by all countries, big or small, on an equal footing. Co-operation through multilateral or bilateral arrangements or other appropriate means is essential to effectively control, prevent, reduce and eliminate adverse environmental effects resulting from activities conducted in all spheres, in such a way that due account is taken of the sovereignty and interests of all States.

PRINCIPLE 25

States shall ensure that international organizations play a co-ordinated, efficient and dynamic role for the protection and improvement of the environment.

PRINCIPLE 26

Man and his environment must be spared the effects of nuclear weapons and all other means of mass destruction. States must strive to reach prompt agreement, in the relevant international organs, on the elimination and complete destruction of such weapons.

Appendix II

RECOMMENDATIONS ADOPTED BY THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT

RECOMMENDATIONS ADOPTED BY THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT

PLANNING AND MANAGEMENT OF HUMAN SETTLEMENTS FOR ENVIRONMENTAL QUALITY

Recommendation 1

The planning, improvement and management of rural and urban settlements demand an approach, at all levels, which embraces all aspects of the human environment, both natural and man-made. Accordingly, it is recommended:

(a) That all development assistance agencies, whether international, such as the United Nations Development Programme and the International Bank for Reconstruction and Development, regional or national, should in their development assistance activities also give high priority within available resources to requests from Governments for assistance in the planning of human settlements, notably in housing, transportation, water, sewerage and public health, the mobilization of human and financial resources, the improvement of transitional urban settlements and the provision and maintenance of essential community services, in order to achieve as far as possible the social well-being of the receiving country as a whole;

(b) That these agencies also be prepared to assist the less industrialized countries in solving the environmental problems of development projects; to this end they should actively support the training and encourage the recruitment of requisite personnel, as far as possible within these countries themselves.

Recommendation 2

1. It is recommended that Governments should designate to the Secretary-General areas in which they have committed themselves (or are prepared to commit themselves) to a long-term programme of improvement and global promotion of the environment.

(a) In this connection, countries are invited to share internationally all relevant information on the problems they encounter and the solutions they devise in developing these areas.

(b) Countries concerned will presumably appoint an appropriate body to plan such a programme, and to supervise its implementation, for areas which could vary in size from a city block to a national region; presumably, too, the programme will be designated to serve, among other purposes, as a vehicle for the preparation and launching of experimental and pilot projects.

(c) Countries which are willing to launch an improvement programme should be prepared to welcome international co-operation, seeking the advice or assistance of competent international bodies.

2. It is further recommended:

(a) That in order to ensure the success of the programme, Governments should urge the Secretary-General to undertake a process of planning and co-ordination whereby contact would be established with nations likely to participate in the programme; international teams of experts might be assembled for that purpose;

(b) That a Conference/Demonstration on Experimental Human Settlements should be held under the auspices of the United Nations in order to provide for co-ordination and the exchange of information and to demonstrate to world public opinion the potential of this approach by means of a display of experimental projects;

(c) That nations should take into consideration Canada's offer to organize such a Conference /Demonstration and to act as host to it.

Recommendation 3

Certain aspects of human settlements can have international implications, for example, the "export" of pollution from urban and industrial areas, and the effects of seaports on international hinterlands. Accordingly, it is recommended that the attention of Governments be drawn to the need to consult bilaterally or regionally whenever environmental conditions or development plans in one country could have repercussions in one or more neighbouring countries.

Recommendation 4

1. It is recommended that Governments and the Secretary-General, the latter in consultation with the appropriate United Nations agencies, take the following steps:

(a) Entrust the over-all responsibility for an agreed programme of environmental research at the international level to any central body that may be given the co-ordinating authority in the field of the environment, taking into account the co-ordination work already being provided on the regional level, especially by the Economic Commission for Europe;

(b) Identify, wherever possible, an existing agency within the United Nations system as the principal focal point for initiating and co-ordinating research in each principal area and, where there are competing claims, establish appropriate priorities;

(c) Designate the following as priority areas for research:

(i) Theories, policies and methods for the comprehensive environmental development of urban and rural settlements;

(ii) Methods of assessing quantitative housing needs and of formulating and implementing phased programmes designed to satisfy them (principal bodies responsible: Department of Economic and Social Affairs of the United Nations Secretariat, regional economic commissions and United Nations Economic and Social Office in Beirut);

(iii) Environmental socio-economic indicators of the quality of human settlements, particularly in terms of desirable occupancy standards and residential densities, with a view to identifying their time trends;

(iv) Socio-economic and demographic factors underlying migration and spatial distribution of population, including the problem of transitional settlements (principal bodies responsible: Department of Economic and Social Affairs of the United Nations Secretariat (Centre for Housing, Building and Planning), United Nations Educational, Scientific and Cultural Organization, World Health Organization, International Labour Organization, Food and Agriculture Organization of the United Nations);

(v) Designs, technologies, financial and administrative procedures for the efficient and expanded production of housing and related infra-structure, suitably adapted to local conditions;

(vi) Water supply, sewerage and waste disposal systems adapted to local conditions, particularly in semi-tropical, tropical, Arctic and sub-Arctic areas (principal body responsible: World Health Organization);

(vii) Alternative methods of meeting rapidly increasing urban transportation needs (principal bodies responsible: Department of Economic and Social Affairs of the United Nations Secretariat (Resources and Transport Division and Centre for Housing, Building and Planning));

(viii) Physical, mental and social effects of stresses created by living and working conditions in human settlements, particularly urban conglomerates, for example the accessibility of buildings to persons whose physical mobility is impaired (principal bodies responsible: International Labour Organization, World Health Organization, United Nations Educational, Scientific and Cultural Organization, Department of Economic and Social Affairs of the United Nations Secretariat).

2. It is further recommended that Governments consider co-operative arrangements to undertake the necessary research whenever the above-mentioned problem areas have a specific regional impact. In such cases, provision should be made for the exchange of information and research findings with countries of other geographical regions sharing similar problems.

Recommendation 5

It is recommended:

(a) That Governments take steps to arrange for the exchange of visits by those who are conducting research in the public or private institutions of their countries;

(b) That Governments and the Secretary-General ensure the acceleration of the exchange of information concerning past and on-going research, experimentation and project implementation covering all aspects of human settlements, which is conducted by the United Nations system or by public or private entities including academic institutions.

Recommendation 6

It is recommended that Governments and the Secretary-General give urgent attention to the training of those who are needed to promote integrated action on the planning, development and management of human settlements.

Recommendation 7

It is recommended:

(a) That Governments and the Secretary-General provide equal possibilities for everybody, both by training and by ensuring access to relevant means and information, to influence their own environment by themselves;

(b) That Governments and the Secretary-General provide that the institutions concerned shall be strengthened and that special training activities shall be established, making use of existing projects of regional environmental development, for the benefit of the less industrialized countries, covering the following:

(i) Intermediate and auxiliary personnel for national public services who, in turn, would be in a

position to train others for similar tasks (Principal bodies responsible: World Health Organization, Department of Economic and Social Affairs of the United Nations Secretariat (Centre for Housing, Building and Planning), United Nations Industrial Development Organization, Food and Agriculture Organization of the United Nations);

(ii) Specialists in environmental planning and in rural development (principal bodies responsible: Department of Economic and Social Affairs of the United Nations Secretariat (Centre for Housing, Building and Planning) Food and Agriculture Organization of the United Nations);

(iii) Community developers for self-help programmes for low-income groups (principal body responsible: Department of Economic and Social Affairs of the United Nations Secretariat (Centre for Housing, Building and Planning), World Health Organization);

(iv) Specialists in working environments (principal bodies responsible: International Labour Organization, Department of Economic and Social Affairs of the United Nations Secretariat (Centre for Housing, Building and Planning), World Health Organization);

(v) Planners and organizers of mass transport systems and services, with special reference to environmental development (principal body responsible: Department of Economic and Social Affairs of the United Nations Secretariat (Resources and Transport Division)).

Recommendation 8

It is recommended that regional institutions take stock of the requirements of their regions for various environmental skills and of the facilities available to meet those requirements in order to facilitate the provision for appropriate training within regions.

Recommendation 9

It is recommended that the World Health Organization increase its efforts to support Governments in planning for improving water supply and sewerage services through its community water supply programme, taking account, as far as possible, of the framework of total environment programmes for communities.

Recommendation 10

It is recommended that development assistance agencies should give higher priority, where justified in the light of the social benefits, to supporting Governments in financing and setting up services for water supply, disposal of water from all sources, and liquid-waste and solid-waste disposal and treatment as part of the objectives of the Second United Nations Development Decade.

Recommendation 11

It is recommended that the Secretary-General ensure that during the preparations for the 1974 World Population Conference, special attention shall be given to population concerns as they relate to the environment and, more particularly, to the environment of human settlements.

Recommendation 12

1. It is recommended that the World Health Organization and other United Nations agencies should provide increased assistance to Governments which so request in the field of family planning programmes without delay.

2. It is further recommended that the World Health Organization should promote and intensify research endeavour in the field of human reproduction, so that the serious consequences of population explosion on human environment can be prevented.

Recommendation 13

It is recommended that the United Nations agencies should focus special attention on the provision of assistance for combating the menace of human malnutrition rampant in many parts of the world. Such assistance will cover training, research and development endeavours on such matters as causes of malnutrition, mass production of high-protein and multipurpose foods, qualitative and quantitative characteristics of routine foods, and the launching of applied nutrition programmes.

Recommendation 14

It is recommended that the intergovernmental body for environmental affairs to be established within the United Nations should ensure that the required surveys shall be made concerning the need and the technical possibilities for developing internationally agreed standards and measuring and limiting noise emissions and that, if it is deemed advisable, such standards shall be applied in the production of means of transportation and certain kinds of working equipment, without a large price increase or reduction in the aid given to developing countries.

Recommendation 15

It is recommended that the Secretary-General, in consultation with the appropriate United Nations bodies, formulate programmes on a world-wide basis to assist countries to meet effectively the require-

ments of growth of human settlements and to improve the quality of life in existing settlements; in particular, in squatter areas.

Recommendation 16

The programmes referred to in recommendation 15 should include the establishment of subregional centres to undertake, inter alia, the following functions:

(a) Training;

(b) Research;

(c) Exchange of Information;

(d) Financial, technical and material assistance.

Recommendation 17

It is recommended that Governments and the Secretary-General take immediate steps towards the establishment of an international fund or a financial institution whose primary operative objectives will be to assist in stengthening national programmes relating to human settlements through the provision of seed capital and the extension of the necessary technical assistance to permit an effective mobilization of domestic resources for housing and the environmental improvement of human settlements.

Recommendation 18

It is recommended that the following recommendations be referred to the Disaster Relief Co-ordinator for his consideration, more particularly in the context of the preparation of a report to the Economic and Social Council:

1. It is recommended that the Secretary-General, with the assistance of the Disaster Relief Co-ordinator and in consultation with the appropriate bodies of the United Nations system and non-governmental bodies:

(a) Assess the over-all requirements for the timely and widespread distribution of warnings which the observational and communications networks must satisfy;

(b) Assess the needs for additional observational networks and other observational systems for natural disaster detection and warnings for tropical cyclones (typhoons, hurricans, cyclones, etc.) and their associated storm surges, torrential rains, floods, tsunamis, earthquakes, etc.;

(c) Evaluate the existing systems for the international communication of disaster warnings, in order to determine the extent to which these require improvement;

(d) On the basis of these assessments, promote, through existing national and international organizations, the establishment of an effective world-wide natural disaster warning system, with special emphasis on tropical cyclones and earthquakes, taking full advantage of existing systems and plans, such as the World Weather Watch, the World Meteorological Organization's Tropical Cyclone Project, the International Tsunami Warning System, the World-Wide Standardized Seismic Network and the Desert Locust Control Organization;

(e) Invite the World Meteorological Organization to promote research on the periodicity and intensity of the occurrence of droughts, with a view to developing improved forecasting techniques.

2. It is further recommended that the United Nations Development Programme and other appropriate international assistance agencies give priority in responding to requests from Governments for the establishment and improvement of natural disaster research programmes and warning systems.

3. It is recommended that the Secretary-General ensure that the United Nations system shall provide to Governments a comprehensive programme of advice and support in disaster prevention. More specifically, the question of disaster prevention should be seen as an integral part of the country programme as submitted to, and reviewed by, the United Nations Development Programme.

4. It is recommended that the Secretary-General take the necessary steps to ensure that the United Nations system shall assist countries with their planning for pre-disaster preparedness. To this end:

(a) An international programme of technical co-operation should be developed, designed to strengthen the capabilities of Governments in the field of pre-disaster planning, drawing upon the services of the resident representatives of the United Nations Development Programme;

(b) The Office of Disaster Relief, with the assistance of relevant agencies of the United Nations, should organize plans and programmes for international co-operation in cases of natural disasters;

(c) As appropriate, non-governmental international agencies and individual Governments should be invited to participate in the preparation of such plans and programmes.

ENVIRONMENTAL ASPECTS OF NATURAL RESOURCES MANAGEMENT

Recommendation 19

It is recommended that the Food and Agriculture Organization of the United Nations, in co-operation with other relevant international organizations, should include in its programme questions relating to rural planning in relation to environmental policy, since environmental policy is formulated in close association with physical planning and with medium-term and long-term economic and social planning. Even in highly industrialized countries, rural areas still cover more than 90 per cent of the territory and consequently should not be regarded as a residual sector and a mere reserve of land and manpower. The programme should therefore include, in particular:

(a) Arrangements for exchanges of such data as are available;

(b) Assistance in training and informing specialists and the public, especially young people, from primary school age onwards;

(c) The formulation of principles for the development of rural areas, which should be understood to comprise not only agricultural areas as such but also small and medium-sized settlements and their hinterland.

Recommendation 20

It is recommended that the Food and Agriculture Organization of the United Nations, in co-operation with other international agencies concerned, strengthen the necessary machinery for the international acquisition of knowledge and transfer of experience on soil capabilities, degradation, conservation and restoration, and to this end:

(a) Co-operative information exchange should be facilitated among those nations sharing similar soils, climate and agricultural conditions;

(i) The Soil Map of the World being prepared by the Food and Agriculture Organization of the United Nations, the United Nations Educational, Scientific and Cultural Organization and the International Society of Soil Science should serve to indicate those areas among which transfer of knowledge on soil potentialities and soil degradation and restoration would be most valuable;

(ii) This map should be supplemented through the establishment of international criteria and methods for the assessment of soil capabilities and degradations and the collection of additional data based upon these methods and criteria. This should permit the preparation of a World Map of Soil Degradation Hazards as a framework for information exchange in this area.

(iii) Information exchange on soil use should account for similarities in vegetation and other environmental conditions as well as those of soil, climate, and agricultural practices;

(iv) The FAO Soil Data-Processing System should be developed beyond soil productivity considerations, to include the above-mentioned data and relevant environmental parameters, and to facilitate information exchange between national soil institutions, and eventually soil-monitoring stations;

(b) International co-operative research on soil capabilities and conservation should be strengthened and broadened to include:

(i) Basic research on soil degradation processes in selected ecosystems under the auspices of the Man and the Biosphere Programme. This research should be directed as a matter of priority to those arid areas that are most threatened;

(ii) Applied research on soil and water conservation practices under specific land-use conditions with the assistance of the Food and Agriculture Organization of the United Nations and, where appropriate, other agencies (United Nations Educational, Scientific and Cultural Organization, World Health Organization and International Atomic Energy Agency);

(iii) Strengthening of existing research centres and, where necessary, establishment of new centres with the object of increasing the production from dry farming areas without any undue impairment of the environment.

(iv) Research on the use of suitable soils for waste disposal and recycling; the United Nations Industrial Development Organization, the Food and Agriculture Organization of the United Nations, and the World Health Organization should enter into joint consultations regarding the feasibility of an international programme in this area;

(c) These efforts for international co-operation in research and information exchange on soils should be closely associated with those of the UNDP/WMO/FAO/UNESCO programme of agricultural biometeorology, in order to facilitate integration of data and practical findings and to support the national programmes of conservation of soil resources recommended above;

(d) It should moreover be noted that in addition to the various physical and climatic phenomena which contribute to soil degradation, economic and social factors contribute to it as well; among the economic contributory factors, one which should be particularly emphasized is the payment of inade-

quate prices for the agricultural produce of developing countries, which prevents farmers in those countries from setting aside sufficient savings for necessary investments in soil regeneration and conservation. Consequently, urgent remedial action should be taken by the organizations concerned to give new value and stability to the prices of raw materials of the developing countries.

Recommendation 21

It is recommended that Governments, the Food and Agriculture Organization of the United Nations and the World Health Organization, in co-operation with the United Nations Educational, Scientific and Cultural Organization and the International Atomic Energy Agency, strengthen and co-ordinate international programmes for integrated pest control and reduction of the harmful effects of agro-chemicals:

(a) Existing international activities for the exchange of information and co-operative research and technical assistance to developing countries should be strengthened to support the national programmes described above, with particular reference to:

(i) Basic research on ecological effects of pesticides and fertilizers (MAB);
(ii) Use of radio-isotope and radiation techniques in studying the fate of pesticides in the environment (joint IAEA/FAO Division);
(iii) Evaluation of the possibility of using pesticides of biological origin in substitution for certain chemical insecticides which cause serious disturbances in the environment;
(iv) Dose and timing of fertilizers' application and their effects on soil productivity and the environment (Food and Agriculture Organization of the United Nations);
(v) Management practices and techniques for integrated pest control, including biological control (Food and Agriculture Organization of the United Nations and World Health Organization);
(vi) Establishment and/or stengthening of national and regional centres for integrated pest control, particularly in developing countries (Food and Agriculture Organization of the United Nations and World Health Organization);

(b) Existing expert committees of the Food and Agriculture Organization of the United Nations and the World Health Organization on various aspects of pest control should be convened periodically:

(i) To assess recent advances in the relevant fields of research mentioned above;
(ii) To review and further develop international guidelines and standards with special reference to national and ecological conditions in relation to the use of chlorinated hydrocarbons, pesticides containing heavy metals and the use and experimentation of biological controls;

(c) In addition, ad hoc panels of experts should be convened, by the Food and Agriculture Organization of the United Nations, the World Health Organization and, where appropriate, the International Atomic Energy Agency, in order to study specific problems, and facilitate the work of the above-mentioned committees.

Recommendation 22

It is recommended that the Food and Agriculture Organization of the United Nations, under its "War on Waste" programme, place increased emphasis on control and recycling of wastes in agriculture:

(a) This programme should assist the national activities relating to:

(i) Control and recycling of crop residues and animal wastes;
(ii) Control and recycling of agro-industrial waste;
(iii) Use of municipal wastes as fertilizers;

(b) The programme should also include measures to avoid wasteful use of natural resources through the destruction of unmarketable agricultural products or their use for improper purposes.

Recommendation 23

It is recommended that Governments, in co-operation with the Food and Agriculture Organization of the United Nations and other agencies and bodies, establish and strengthen regional and international machinery for the rapid development and management of domesticated livestock of economic importance and their related environmental aspects as part of the ecosystems, particularly in areas of low annual productivity, and thus encourage the establishment of regional livestock research facilities, councils and commissions, as appropriate.

Recommendation 24

It is recommended that the Secretary-General take steps to ensure that the United Nations bodies concerned co-operate to meet the needs for new knowledge on the environmental aspects of forests and forest management:

(a) Where appropriate, research should be promoted, assisted, co-ordinated, or undertaken by the Man and the Biosphere Programme (UNESCO), in close co-operation with the Food and Agriculture Organization of the United Nations and the World Meteorological Organization, and with the collabora-

tion of the International Council of Scientific Unions and the International Union of Forestry Research Organizations;

(b) Research on comparative legislation, land tenure, institutions, tropical forest management, the effects of the international trade in forest products on national forest environments, and public administration, should be sponsored or co-ordinated by FAO, in co-operation with other appropriate international and regional organizations;

(c) The Food and Agriculture Organization of the United Nations, in conjunction with the United Nations Educational, Scientific and Cultural Organization and other appropriate international organizations, should give positive advice to member countries on the important role of forests with reference to, and in conjunction with, the conservation of soil, watersheds, the protection of tourist sites and wildlife, and recreation, within the over-all framework of the interests of the biosphere.

Recommendation 25

It is recommended that the Secretary-General take steps to ensure that continuing surveillance, with the co-operation of Member States, of the world's forest cover shall be provided for through the programmes of the Food and Agriculture Organization of the United Nations and the United Nations Educational, Scientific and Cultural Organization.

(a) Such a World Forest Appraisal Programme would provide basic data, including data on the balance between the world's forest biomass and the prevailing environment, and changes in the forest biomass, considered to have a significant impact on the environment;

(b) The information could be collected from existing inventories and on-going activities and through remote-sensing techniques;

(c) The forest protection programme described above might be incorporated within this effort, through the use of advanced technology, such as satellites which use different types of imagery and which could constantly survey all forests.

Recommendation 26

It is recommended that the Food and Agriculture Organization of the United Nations co-ordinate an international programme for research and exchange of information on forest fires, pests and diseases:

(a) The programme should include data collection and dissemination, identification of potentially susceptible areas and of means of suppression; exchange of information on technologies, equipment and techniques; research, including integrated pest control and the influence of fires on forest ecosystems, to be undertaken by the International Union of Forestry Research Organization; establishment of a forecasting system in co-operation with the World Meteorological Organization; organization of seminars and study tours, the facilitation of bilateral agreements for forest protection between neighbouring countries, and the development of effective international quarantines;

(b) Forest fires, pests and diseases will frequently each require separate individual treatment.

Recommendation 27

It is recommended that the Food and Agriculture Organization of the United Nations facilitate the transfer of information on forests and forest management:

(a) The amount of knowledge that can usefully be exchanged is limited by the differences of climatic zones and forest types;

(b) The exchange of information should however be encouraged among nations sharing similarities; considerable knowledge is already exchanged among the industrialized nations of the temperate zone;

(c) Opportunities exist, despite differences, for the useful transfer of information to developing countries on the environmental aspects of such items as: (i) the harvesting and industrialization of some tropical hardwoods; (ii) pine cultures; (iii) the principles of forest management systems and management science; (iv) soils and soil interpretations relating to forest management; (v) water regimes and watershed management; (vi) forest industries pollution controls, including both technical and economic data; (vii) methods for the evaluation of forest resources through sampling techniques, remote sensing, and data-processing; (viii) control of destructive fires and pest outbreaks; and (ix) co-ordination in the area of the definition and standardization of criteria and methods for the economic appraisal of forest environmental influences and for the comparison of alternative uses.

Recommendation 28

It is recommended that the Food and Agriculture Organization of the United Nations strengthen its efforts in support of forestry projects and research projects, possibly for production, in finding species which are adaptable even in areas where this is exceptionally difficult because of ecological conditions.

Recommendation 29

It is recommended that the Secretary-General ensure that the effect of pollutants upon wildlife shall be considered, where appropriate, within environmental monitoring systems. Particular attention should be paid to those species of wildlife that may serve as indicators for future wide environmental disturbances, and an ultimate impact upon human populations.

Recommendation 30

It is recommended that the Secretary-General ensure the establishment of a programme to expand present data-gathering processes so as to assess the total economic value of wildlife resources;

(a) Such data would facilitate the task of monitoring the current situation of animals endangered by their trade value, and demonstrate to questioning nations the value of their resources;

(b) Such a programme should elaborate upon current efforts of the Food and Agriculture Organization of the United Nations and might well produce a yearbook of wildlife statistics.

Recommendation 31

It is recommended that the Secretary-General ensure that the appropriate United Nations agencies co-operate with the Governments of the developing countries to develop special short-term training courses on wildlife 1 management:

(a) Priority should be given to conversion courses for personnel trained in related disciplines such as forestry or animal husbandry;

(b) Special attention should be given to the establishment and support of regional training schools for technicians.

Recommendation 32

It is recommended that Governments give attention to the need to enact international conventions and treaties to protect species inhabiting international waters or those which migrate from one country to another:

(a) A broadly-based convention should be considered which would provide a framework by which criteria for game regulations could be agreed upon and the over-exploitation of resources curtailed by signatory countries;

(b) A working group should be set up as soon as possible by the appropriate authorities to consider these problems and to advise on the need for, and possible scope of, such conventions or treaties.

Recommendation 33

It is recommended that Governments agree to strengthen the international whaling commission, to increase international research efforts, and as a matter of urgency to call for an international agreement, under the auspices of the international whaling commission and involving all Governments concerned, for a 10-year moratorium on commercial whaling.

Recommendation 34

It is recommended that Governments and the Secretary-General give special attention to training requirements on the management of parks and protected areas:

(a) High-level training should be provided and supported:
  (i) In addition to integrating aspects of national parks planning and management into courses on forestry and other subjects, special degrees should be offered in park management; the traditional forestry, soil and geology background of the park manager must be broadened into an integrated approach;
  (ii) Graduate courses in natural resources administration should be made available in at least one major university in every continent;

(b) Schools offering courses in national park management at a medium-grade level should be assisted by the establishment or expansion of facilities, particularly in Latin America and Asia.

Recommendation 35

It is recommended that the Secretary-General take steps to ensure that an appropriate mechanism shall exist for the exchange of information on national parks legislation and planning and management techniques developed in some countries which could serve as guidelines to be made available to any interested country.

Recommendation 36

It is recommended that the Secretary-General take steps to ensure that the appropriate United Nations agencies shall assist the developing countries to plan for the inflow of visitors into their protected areas in such a way as to reconcile revenue and environmental considerations within the context

of the recommendations approved by the Conference. The other international organizations concerned may likewise make their contribution.

Recommendation 37

It is recommended that Governments take steps to co-ordinate, and co-operate in the management of neighbouring or contiguous protected areas. Agreement should be reached on such aspects as mutual legislation, patrolling systems, exchange of information, research projects, collaboration on measures of burning, plant and animal control, fishery regulations, censuses, tourist circuits and frontier formalities.

Recommendation 38

It is recommended that Governments take steps to set aside areas representing ecosystems of international significance for protection under international agreement.

Recommendation 39

It is recommended that Governments, in co-operation with the Secretary-General of the United Nations and the Food and Agriculture Organization of the United Nations where indicated, agree to an international programme to preserve the world's genetic resources:

(a) Active participation at the national and international levels is involved. It must be recognized, however, that while survey, collection, and dissemination of these genetic resources are best carried out on a regional or international basis, their actual evaluation and utilization are matters for specific institutions and individual workers; international participation in the latter should concern exchange of techniques and findings;

(b) An international network is required with appropriate machinery to facilitate the interchange of information and genetic material among countries;

(c) Both static (seed banks, culture collection etc.) and dynamic (conservation of populations in evolving natural environments) ways are needed.

(d) Action is necessary in six interrelated areas:
- (i) Survey of genetic resources;
- (ii) Inventory of collections;
- (iii) Exploration and collecting;
- (iv) Documentation;
- (v) Evaluation and utilization;
- (vi) Conservation, which represents the crucial element to which all other programmes relate;

(e) Although the international programme relates to all types of genetic resources, the action required for each resource will vary according to existing needs and activities.

Recommendation 40

It is recommended that Governments, in co-operation with the Secretary-General of the United Nations and the Food and Agriculture Organization of the United Nations where indicated, made inventories of the genetic resources most endangered by depletion or extinction:

(a) All species threatened by man's development should be included in such inventories;

(b) Special attention should be given to locating in this field those areas of natural genetic diversity that are disappearing;

(c) These inventories should be reviewed periodically and brought up to date by appropriate monitoring;

(d) The survey conducted by FAO in collaboration with the International Biological Programme is designed to provide information on endangered crop genetic resources by 1972, but will require extension and follow-up.

Recommendation 41

It is recommended that Governments, in co-operation with the Secretary-General of the United Nations and the Food and Agriculture Organization of the United Nations where indicated, compile or extend, as necessary, registers of existing collections of genetic resources.

(a) Such registers should identify which breeding and experiment stations, research institutions and universities maintain which collections;

(b) Major gaps in existing collections should be identified where material is in danger of being lost;

(c) These inventories of collections should be transformed for computer handling and made available to all potential users;

(d) In respect of plants:

(i) It would be expected that the "advanced varieties" would be well represented, but that primitive materials would be found to be scarce and require subsequent action;

(ii) The action already initiated by FAO, several national institutions, and international foundations should be supported and expanded.

(e) In respect of micro-organisms, it is recommended that each nation develop comprehensive inventories of culture collections:

(i) A cataloguing of the large and small collections and the value of their holdings is required, rather than a listing of individual strains;

(ii) Many very small but unique collections, sometimes the works of a single specialist, are lost;

(iii) Governments should make sure that valuable gene pools held by individuals or small institutes are also held in national or regional collections.

(f) In respect of animal germ plasm, it is recommended that FAO establish a continuing mechanism to assess and maintain catalogues of the characteristics of domestic animal breeds, types and varieties in all nations of the world. Likewise, FAO should establish such lists where required.

(g) In respect of aquatic organisms, it is recommended that FAO compile a catalogue of genetic resources of cultivated species and promote intensive studies on the methods of preservation and storage of genetic material.

Recommendation 42

It is recommended that Governments, in co-operation with the Secretary-General of the United Nations and the Food and Agriculture Organization of the United Nations where indicated, initiate immediately, in co-operation with all interested parties, programmes of exploration and collection wherever endangered species have been identified which are not included in existing collections:

(a) An emergency programme, with the co-operation of the Man and the Biosphere Programme, of plant exploration and collection should be launched on the basis of the FAO List of Emergency Situations for a five-year period:

(b) With regard to forestry species, in addition to the efforts of the Danish/FAO Forest Tree Seed Centre, to International Union of Forestry Research Organizations, and the FAO Panel of experts on Forest Gene Resources, support is needed for missions planned for Latin America, West Africa, the East Indies and India.

Recommendation 43

It is recommended that Governments, in co-operation with the Secretary-General of the United Nations and the Food and Agriculture Organization of the United Nations were indicated:

1. Recognize that conservation is a most crucial part of any genetic resources programme. Moreover, major types of genetic resources must be treated separately because:

(a) They are each subject to different programmes and priorities;

(b) They serve different uses and purposes;

(c) They require different expertise, techniques and facilities;

2. In respect of plant germ plasms (agriculture and forestry), organize and equip national or regional genetic resources conservation centres:

(a) Such centres as the National Seed Storage Laboratory in the United States of America and the Vavilov Institute of Plant Industry in the Union of Soviet Socialist Republics already provide good examples;

(b) Working collections should be established separately from the basic collections; these will usually be located at plant and breeding stations and will be widely distributed;

(c) Three classes of genetic crop resources must be conserved:

(i) High-producing varieties in current use and those they have superseded;

(ii) Primitive varieties of traditional pre-scientific agriculture (recognized as genetic treasuries for plant improvement);

(iii) Mutations induced by radiation or chemical means;

(d) Species contributing to environmental improvement, such as sedge used to stabilize sand-dunes, should be conserved;

(e) Wild or weed relatives of crop species and those wild species of actual or potential use in rangelands, industry, new crops etc. should be included;

3. In respect of plant germ plasms (agriculture and forestry), maintain gene pools of wild plant species within their natural communities. Therefore:

(a) It is essential that primeval forests, bushlands and grasslands which contain important forest genetic resources be identified and protected by appropriate technical and legal means; systems of reserves exist in most countries, but a strengthening of international understanding on methods of protection and on availability of material may be desired;

(b) Conservation of species of medical, aesthetic or research value should be assured;

(c) The network of biological reserves proposed by UNESCO (Man and the Biosphere Programme) should be designed, were feasible, to protect these natural communities;

(d) Where protection in nature becomes uncertain or impossible, then means such as seed storage or living collections in provenance trials or botanic gardens must be adopted;

4. Fully implement the programmes initiated by the FAO Panels of Experts on forest gene resources in 1968 and on plant exploration and introduction in 1970;

5. In respect of animal germ plasms, consider the desirability and feasibility of international action to preserve breeds or varieties of animals;

(a) Because such an endeavour would constitute a major effort beyond the scope of any one nation, FAO would be the logical executor of such a project. Close co-operation with Governments would be necessary, however. The International Union for Conservation of Nature and Natural Resources might, logically, be given responsibility for wild species, in co-operation with FAO, the Man and the Biosphere Programme (UNESCO), and Governments.

(b) Any such effort should also include research on methods of preserving, storing, and transporting germ plasm;

(c) Specific methods for the maintenance of gene pools of aquatic species should be developed;

(d) The recommendations of the FAO Working Party Meeting on Genetic Selection and Conservation of Genetic Resources of Fish, held in 1971, should be implemented;

6. In respect of micro-organism germ plasms, co-operatively establish and properly fund a few large regional collections:

(a) Full use should be made of major collections now in existence;

(b) In order to provide geographical distribution and access to the developing nations, regional centres should be established in Africa, Asia and Latin America and the existing centres in the developed world should be strengthened;

7. Establish conservation centres of insect germ plasm. The very difficult and long process of selecting or breeding insects conducive to biological control programmes can begin only in this manner.

Recommendation 44

It is recommended that Governments, in co-operation with the Secretary-General of the United Nations and the Food and Agriculture Organization of the United Nations were indicated, recognize that evaluation and utilization are critical corollaries to the conservation of genetic resources. In respect of crop-breeding programmes, it is recommended that Governments give special emphasis to:

(a) The quality of varieties and breeds and the potential for increased yields;

(b) The ecological conditions to which the species are adapted;

(c) The resistance to diseases, pests and other adverse factors;

(d) The need for a multiplicity of efforts so as to increase the chances of success.

Recommendation 45

It is recommended that Governments, in co-operation with the Secretary-General of the United Nations and the Food and Agriculture Organization of the United Nations where indicated:

1. Collaborate to establish a global network of national and regional institutes relating to genetic resource conservation based on agreements on the availability of material and information, on methods, on technical standards, and on the need for technical and financial assistance wherever required:

(a) Facilities should be designed to assure the use of the materials and information: (i) by breeders, to develop varieties and breeds both giving higher yields and having higher resistance to local pests and diseases and other adverse factors; and (ii) by users providing facilities and advice for the safest and most profitable utilization of varieties and breeds most adapted to local conditions;

(b) Such co-operation would apply to all genetic resource conservation centres and to all types mentioned in the foregoing recommendations;

(c) Standardized storage and retrieval facilities for the exchange of information and genetic material should be developed:

(i) Information should be made generally available and its exchange facilitated through agreement on methods and technical standards;

(ii) International standards and regulations for the shipment of materials should be agreed upon;
(iii) Basic collections and data banks should be replicated in at least two distinct sites, and should remain a national responsibility;
(iv) A standardized and computerized system of documentation is required;

(d) Technical and financial assistance should be provided where required; areas of genetic diversity are most frequently located in those countries most poorly equipped to institute the necessary programmes;

2. Recognize that the need for liaison among the parties participating in the global system of genetic resources conservation requires certain institutional innovations. To this end:

(a) It is recommended that the appropriate United Nations agency establish an international liaison unit for plant genetic resources in order:
(i) To improve liaison between governmental and non-governmental efforts;
(ii) To assist in the liaison and co-operation between national and regional centres, with special emphasis on international agreements on methodology and standards of conservation of genetic material, standardization and co-ordination of computerized record systems, and the exchange of information and material between such centres;
(iii) To assist in implementing training courses in exploration, conservation and breeding methods and techniques;
(iv) To act as a central repository for copies of computerized information on gene pools (discs and tapes);
(v) To provide the secretariat for periodic meetings of international panels and seminars on the subject; a conference on germ plasm conservation might be convened to follow up the successful conference of 1967;
(vi) To plan and co-ordinate the five-year emergency programme on the conservation of endangered species;
(vii) To assist Governments further, wherever required, in implementing their national programmes;
(viii) To promote the evaluation and utilization of genetic resources at the national and international levels;

(b) It is recommended that the appropriate United Nations agency initiate the required programme on micro-organism germ plasm:
(i) Periodic international conferences involving those concerned with the maintenance of and research on gene pools of micro-organisms should be supported;
(ii) Such a programme might interact with the proposed regional culture centres by assuring that each centre places high priority on the training of scientists and technicians from the developing nations; acting as a necessary liaison; and lending financial assistance to those countries established outside the developed countries;
(iii) The international exchange of pure collections of micro-organisms between the major collections of the world has operated for many years and requires little re-enforcement;
(iv) Study should be conducted particularly on waste disposal and recycling, controlling diseases and pests, and food technology and nutrition;

(c) It is recommended that the Food and Agriculture Organization of the United Nations, institute a programme in respect of animal germ plasm to assess and maintain catalogues of the economic characteristics of domestic animal breeds and types of wild species and to establish gene pools of potentially useful types;

(d) It is recommended that the Man and the Biosphere project on the conservation of natural areas and the genetic material contained therein should be adequately supported.

Recommendation 46

It is recommended that Governments, and the Secretary-General in co-operation with the Food and Agriculture Organization of the United Nations and other United Nations organizations concerned, as well as development assistance agencies, take steps to support recent guidelines, recommendations and programmes of the various international fishing organizations. A large part of the needed international action has been identified with action programmes initiated by FAO and its Intergovernmental Committee on Fisheries and approximately 24 other bilateral and multilateral international commissions, councils and committees. In particular these organizations are planning and undertaking:

(a) Co-operative programmes such as that of LEPOR (Long-term and Expanded Programme of Oceanic Research), GIPME (Global Investigation of Pollution in the Marine Environment) and IBP (International Biological Programme);

(b) Exchange of data, supplementing and expanding the services maintained by FAO and bodies within its framework in compiling, disseminating and co-ordinating information on living aquatic resources and their environment and fisheries activities;

(c) Evaluation and monitoring of world fishery resources, environmental conditions, stock assessment, including statistics on catch and effort, and the economics of fisheries;

(d) Assistance to Governments in interpreting the implications of such assessments, identifying alternative management measures, and formulating required actions;

(e) Special programmes and recommendations for management of stocks of fish and other aquatic animals proposed by the existing international fishery bodies. Damage to fish stocks has often occurred because regulatory action is taken too slowly. In the past, the need for management action to be nearly unanimous has reduced action to the minimum acceptable level.

Recommendation 47

It is recommended that Governments, and the Secretary-General of the United Nations in co-operation with the Food and Agriculture Organization of the United Nations and other United Nations organizations concerned, as well as development assistance agencies take steps to ensure close participation of fishery agencies and interests in the preparations for the United Nations Conference on the Law of the Sea. In order to safeguard the marine environment and its resources through the development of effective and workable principles and laws, the information and insight of international and regional fishery bodies, as well as the national fishery agencies are essential.

Recommendation 48

It is recommended that Governments, and the Secretary-General in co-operation with the Food and Agriculture Organization of the United Nations and other United Nations organizations concerned, as well as development assistance agencies, take steps to ensure international co-operation in the research, control and regulation of the side effects of national activities in resource utilization where these affect the aquatic resources of other nations:

(a) Estuaries, intertidal marshes, and other near-shore and in-shore environments play a crucial role in the maintenance of several marine fish stocks. Similar problems exist in those fresh-water fisheries that occur in shared waters;

(b) Discharge of toxic chemicals, heavy metals, and other wastes may affect even high-seas resources;

(c) Certain exotic species, notably the carp, lamprey and alewife, have invaded international waters with deleterious effects as a result of unregulated unilateral action.

Recommendation 49

It is recommended that Governments, and the Secretary-General of the United Nations in co-operation with the Food and Agriculture Organization of the United Nations and other United Nations organizations concerned, as well as development assistance agencies, take steps to develop further and strengthen facilities for collecting, analysing and disseminating data on living aquatic resources and the environment in which they live:

(a) Data already exists concerning the total harvest from the oceans and from certain regions in respect of individual fish stocks, their quantity, and the fishing efforts expended on them, and in respect of their population structure, distribution and changes. This coverage needs to be improved and extended;

(b) It is clear that a much greater range of biological parameters must be monitored and analysed in order to provide an adequate basis for evaluating the interaction of stocks and managing the combined resources of many stocks. There is no institutional constraint on this expansion but a substantial increase in funding is needed by FAO and other international organizations concerned to meet this expanding need for data;

(c) Full utilization of present and expanded data facilities is dependent on the co-operation of Governments in developing local and regional data networks, making existing data available to FAO and to the international bodies, and formalizing the links between national and international agencies responsible for monitoring and evaluating fishery resources.

Recommendation 50

It is recommended that Governments, and the Secretary-General of the United Nations in co-operation with the Food and Agriculture Organization of the United Nations and other United Nations organizations concerned, as well as development assistance agencies, take steps to ensure full co-operation among Governments by stengthening the existing international and regional machinery for development and management of fisheries and their related environmental aspects and, in those regions where these do not exist, to encourage the establishment of fishery councils and commissions as appropriate.

(a) The Operational efficiency of these bodies will depend largely on the ability of the participating countries to carry out their share of the activities and programmes:

(b) Technical support and servicing from the specialized agencies, in particular from FAO, is also required;

(c) The assistance of bilateral and international funding agencies will be needed to ensure the full participation of the developing countries in these activities.

Recommendation 51

It is recommended that Governments concerned consider the creation of river-basin commissions or other appropriate machinery for co-operation between interested States for water resources common to more than one jurisdiction.

(a) In accordance with the Charter of the United Nations and the principles of international law full consideration must be given to the right of permanent sovereignty of each country concerned to develop its own resources;

(b) The following principles should be considered by the States concerned when appropriate:

(i) Nations agree that when major water resource activities are contemplated that may have a significant environmental effect on another country, the other country should be notified well in advance of the activity envisaged;

(ii) The basic objective of all water resource use and development activities from the environmental point of view is to ensure the best use of water and to avoid its pollution in each country;

(iii) The net benefits of hydrologic regions common to more than one national jurisdiction are to be shared equitably by the nations affected;

(c) Such arrangements, when deemed appropriate by the States concerned, will permit undertaking on a regional basis:

(i) Collection, analysis, and exchanges of hydrologic data through some international mechanism agreed upon by the States concerned;

(ii) Joint data-collection programmes to serve planning needs;

(iii) Assessment of environmental effects of existing water uses;

(iv) Joint study of the causes and symptoms of problems related to water resources, taking into account the technical, economic, and social considerations of water quality control;

(v) Rational use, including a programme of quality control, of the water resource as an environmental asset;

(vi) Provision for the judicial and administrative protection of water rights and claims;

(vii) Prevention and settlement of disputes with reference to the management and conservation of water resources;

(viii) Financial and technical co-operation of a shared resource;

(d) Regional conferences should be organized to promote the above considerations.

Recommendation 52

It is recommended that the Secretary-General take steps to ensure that appropriate United Nations bodies support Government action where required:

1. Reference is made to the Food and Agriculture Organization of the United Nations, the World Health Organization, the World Meteorological Organization, the Department of Economic and Social Affairs of the United Nations Secretariat (Resources and Transport Division), the United Nations Educational, Scientific and Cultural Organization/International Hydrological Decade, the regional economic commissions and the United Nations Economic and Social Office in Beirut. For example:

(a) The Food and Agriculture Organization of the United Nations has established a Commission on Land and Water Use for the Middle East which promotes regional co-operation in research, training and information, inter alia on water management problems;

(b) The World Health Organization has available the International Reference Centre for Waste Disposal located at Dubendorf, Switzerland, and International Reference Centre on Community Water Supply in the Netherlands;

(c) The World Meteorological Organization has a Commission on Hydrology which provides guidance on data collection and on the establishment of hydrological networks;

(d) The Resources and Transport Division of the Department of Economic and Social Affairs, United Nations Secretariat, has the United Nations Water Resources Development Centre;

(e) The United Nations Educational, Scientific and Cultural Organization is sponsoring the International Hydrological Decade Programme of co-ordinated research on the quality and quantity of world water resources.

2. Similar specialized centres should be established at the regional level in developing countries for training research and information exchange on:

(a) Inland water pollution and waste disposal in co-operation with the World Health Organization, the Food and Agricultural Organization of the United Nations, the United Nations regional economic commissions and the United Nations Economic and Social Office in Beirut;

(b) Water management for rain-fed and irrigated agriculture, by the Food and Agriculture Organization of the United Nations in co-operation with the regional economic commissions and the United Nations Economic and Social Office in Beirut;

(c) Integrated water resources planning and management in co-operation with the Department of Economic and Social Affairs of the United Nations Secretariat (Resources and Transport Division), the regional economic commissions, and the United Nations Economic and Social Office in Beirut.

Recommendation 53

It is recommended that the Secretary-General take steps to ensure that the United Nations system is prepared to provide technical and financial assistance to Governments when requested in the different functions of water resources management:

(a) Surveys and inventories;

(b) Water resources administration and policies, including:
  (i) The establishment of institutional frameworks;
  (ii) Economic structures of water resources management and development;
  (iii) Water resources law and legislation;

(c) Planning and management techniques, including:
  (i) The assignment of water quality standards;
  (ii) The implementation of appropriate technology;
  (iii) More efficient use and re-use of limited water supplies;

(d) Basic and applied studies and research;

(e) Transfer of existing knowledge;

(f) Continuing support of the programme of the International Hydrological Decade.

Recommendation 54

It is recommended that the Secretary-General take steps to establish a roster of experts who would be available to assist Governments, upon request, to anticipate and evaluate the environmental effects of major water development projects. Governments would have the opportunity of consulting teams of experts drawn from this roster, in the first stages of project planning. Guidelines could be prepared to assist in the review and choices of alternatives.

Recommendation 55

It is recommended that the Secretary-General take steps to conduct an exploratory programme to assess the actual and potential environmental effects of water management upon the oceans, define terms and estimate the costs for a comprehensive programme of action, and establish and maintain as far as possible:

(a) A world registry of major or otherwise important rivers arranged regionally and classified according to their discharge of water and pollutants;

(b) A world registry of clean rivers which would be defined in accordance with internationally agreed quality criteria and to which nations would contribute on a voluntary basis:
  (i) The oceans are the ultimate recipients for the natural and man-made wastes discharged into the river systems of the continents;
  (ii) Changes in the amount of river-flow into the oceans, as well as in its distribution in space and time, any considerably affect the physical, chemical and biological regime of the estuary regions and influence the oceanic water systems;
  (iii) It would be desirable for nations to declare their intention to have admitted to the world registry of clean rivers those rivers within their jurisdiction that meet the quality criteria as defined and to declare their further intention to ensure that certain other rivers shall meet those quality criteria by some target date.

Recommendation 56

It is recommended that the Secretary-General provide the appropriate vehicle for the exchange of information on mining and mineral processing.

(a) Improved accessibility and dissemination of existing information is required; the body of literature and experience is already larger than one would think.

(b) Possibilities include the accumulation of information on: (i) the environmental conditions of mine sites; (ii) the action taken in respect of the environment; and (iii) the positive and negative environmental repercussions.

(c) Such a body of information could be used for prediction. Criteria for the planning and management of mineral production would emerge and would indicate where certain kinds of mining should be limited, where reclamation costs would be particularly high, or where other problems would arise.

(d) The appropriate United Nations bodies should make efforts to assist the developing countries by, inter alia, providing adequate information for each country on the technology for preventing present or future environmentally adverse effects of mining and the adverse health and safety effects associated with the mineral industry and by accepting technical trainees and sending experts.

Recommendation 57

It is recommended that the Secretary-General take steps to ensure proper collection, measurement and analysis of data relating to the environmental effects of energy use and production within appropriate monitoring systems.

(a) The design and operation of such networks should include, in particular, monitoring the environmental levels resulting from emission of carbon dioxide, sulphur dioxide, oxidants, nitrogen oxides (NO_X), heat and particulates, as well as those from releases of oil and radioactivity;

(b) In each case the objective is to learn more about the relationships between such levels and the effects on weather, human health, plant and animal life, and amenity values.

Recommendation 58

It is recommended that the Secretary-General take steps to give special attention to providing a mechanism for the exchange of information on energy:

(a) The rationalization and integration of resource management for energy will clearly require a solid understanding of the complexity of the problem and of the multiplicity of alternative solutions;

(b) Access to the large body of existing information should be facilitated:

(i) Data on the environmental consequences of different energy systems should be provided through an exchange of national experiences, studies, seminars, and other appropriate meetings;

(ii) A continually updated register of research involving both entire systems and each of its stages should be maintained.

Recommendation 59

It is recommended that the Secretary-General take steps to ensure that a comprehensive study be promptly undertaken with the aim of submitting a first report, at the latest in 1975, on available energy sources, new technology, and consumption trends, in order to assist in providing a basis for the most effective development of the world's energy resources, with due regard to the environmental effects of energy production and use: such a study to be carried out in collaboration with appropriate international bodies such as the International Atomic Energy Agency and the Organization for Economic Co-operation and Development.

Recommendation 60

It is recommended that the Secretary-General, in co-operation with Governments concerned and the appropriate international agencies, arrange for systematic audits of natural resource development projects in representative ecosystems of international significance to be undertaken jointly with the Governments concerned after, and where feasible before, the implementation of such projects.

Projects might include new agricultural settlement of subtropical and tropical zones, irrigation and drainage in arid zones, tropical forestry development, major hydroelectric developments, land reclamation works in tropical lowland coastal areas, and settlement of nomads in semi-arid zones. The cost of audits in developing countries should not be imputed to the costs of the resource development projects but financed from separate international sources.

Recommendation 61

It is recommended that the Secretary-General, in co-operation with Governments concerned and the appropriate international agencies, provide that pilot studies be conducted in representative ecosystems of international significance to assess the environmental impact of alternative approaches to the survey, planning and development of resource projects.

Recommendation 62

It is recommended that the Secretary-General, in co-operation with Governments concerned and the appropriate international agencies, provide that studies be conducted to find out the connection between the distribution of natural resources and people's welfare and the reasons for possible discrepancies.

Recommendation 63

It is recommended that the Secretary-General take steps to ensure that international development assistance agencies, in co-operation with recipient Governments, intensify efforts to revise and broaden the criteria of development project analysis to incorporate environmental impact considerations.

Recommendation 64

It is recommended that the Secretary-General take steps to ensure that the United Nations agencies concerned undertake studies on the relative costs and benefits of synthetic versus natural products serving identical uses.

Recommendation 65

It is recommended that the Man and the Biosphere Programme be vigorously pursued by the United Nations Educational, Scientific and Cultural Organization in co-operation with other United Nations organizations and other international scientific organizations.

Recommendation 66

It is recommended that World Meteorological Organization initiate or intensify studies on the interrelationships of resource development and meteorology.

Recommendation 67

It is recommended that the Secretary-General, in co-operation with interested Governments and United Nations specialized agencies, take the necessary steps to encourage the further development of remote-sensing techniques for resources surveys and the utilization of these techniques on the basis of proper international arrangements.

Recommendation 68

It is recommended that the Secretary-General, in co-operation with the appropriate agencies of the United Nations and other international organizations, promote jointly with interested governments the development of methods for the integrated planning and management of natural resources, and provide, when requested, advice to Governments on such methods, in accordance with the particular environmental circumstances of each country.

Recommendation 69

It is recommended that the Food and Agriculture Organization of the United Nations expand its present programme on the stabilization of marginal lands.

IDENTIFICATION AND CONTROL OF POLLUTANTS OF BROAD INTERNATIONAL SIGNIFICANCE

A. POLLUTION GENERALLY

Recommendation 70

It is recommended that Governments be mindful of activities in which there is an appreciable risk of effects on climate, and to this end:

(a) Carefully evaluate the likelihood and magnitude of climatic effects and disseminate their findings to the maximum extent feasible before embarking on such activities;

(b) Consult fully other interested States when activities carrying a risk of such effects are being contemplated or implemented.

Recommendation 71

It is recommended that Governments use the best practicable means available to minimize the release to the environment of toxic or dangerous substances, especially if they are persistent substances such as heavy metals and organochlorine compounds, until it has been demonstrated that their release will not give rise to unacceptable risks or unless their use is essential to human health or food production, in which case appropriate control measures should be applied.

Recommendation 72

It is recommended that in establishing standards for pollutants of international significance, Governments take into account the relevant standards proposed by competent international organizations, and concert with other concerned Governments and the competent international organizations in planning and carrying out control programmes for pollutants distributed beyond the national jurisdiction from which they are released.

Recommendation 73

It is recommended that Governments actively support, and contribute to, international programmes to acquire knowledge for the assessment of pollutant sources, pathways, exposures and risks and that those Governments in a position to do so provide educational, technical and other forms of assistance to facilitate broad participation by countries regardless of their economic or technical advancement.

Recommendation 74

It is recommended that the Secretary-General, drawing on the resources of the entire United Nations system, and with the active support of Governments and appropriate scientific and other international bodies:

(a) Increase the capability of the United Nations system to provide awareness and advance warning of deleterious effects to human health and well-being from man-made pollutants;

(b) Provide this information in a form which is useful to policymakers at the national level;

(c) Assist those Governments which desire to incorporate these and other environmental factors into national planning processes;

(d) Improve the international acceptability of procedures for testing pollutants and contaminants by:

(i) International division of labour in carrying out the large-scale testing programmes needed;

(ii) Development of international schedules of tests for evaluation of the environmental impact-potential of specific contaminants or products. Such a schedule of tests should include consideration of both short-term and long-term effects of all kinds, and should be reviewed and brought up to date from time to time to take into account new knowledge and techniques;

(iii) Development and implementation of an international inter-calibration programme for sampling and analytical techniques to permit more meaningful comparisons of national data;

(iv) Develop plans for an International Registry of Data on Chemicals in the Environment based on a collection of available scientific data on the environmental behaviour of the most important man-made chemicals and containing production figures of the potentially most harmful chemicals, together with their pathways from factory via utilization to ultimate disposal or recirculation.

Recommendation 75

It is recommended that, without reducing in any way their attention to non-radioactive pollutants, Governments should:

(a) Explore with the International Atomic Energy Agency and the World Health Organization the feasibility of developing a registry of releases to the biosphere of significant quantities of radioactive materials;

(b) Support and expand, under the International Atomic Energy Agency and appropriate international organizations, international co-operation on radioactive waste problems, including problems of mining and tailings and also including co-ordination of plans for the siting of fuel-reprocessing plants in relation to the siting of the ultimate storage areas, considering also the transportation problems.

Recommendation 76

It is recommended;

(a) That a major effort be undertaken to develop monitoring and both epidemiological and experimental research programmes providing data for early warning and prevention of the deleterious effects of the various environmental agents, acting singly or in combination, to which man is increasingly exposed, directly or indirectly, and for the assessment of their potential risks to human health, with particular regard to the risks of mutagenicity, teratogenicity and carcinogenicity. Such programmes should be guided and co-ordinated by the World Health Organization;

(b) That the World Health Organization co-ordinate the development and implementation of an appropriate international collection and dissemination system to correlate medical, environmental and family-history data;

(C) That Governments actively support and contribute to international programmes for research and development of guidelines concerning environmental factors in the work environment.

Recommendation 77

It is recommended that the World Health Organization, in collaboration with the relevant agencies, in the context of an approved programme, and with a view to suggesting necessary action, assist Governments, particularly those of developing countries, in undertaking co-ordinated programmes of monitoring of air and water and in establishing monitoring systems in areas where there may be a risk to health from pollution.

Recommendation 78

It is recommended that internationally co-ordinated programmes of research and monitoring of food contamination by chemical and biological agents be established and developed jointly by the Food and Agriculture Organization of the United Nations and the World Health Organization, taking into account national programmes, and that the results of monitoring be expeditiously assembled, evaluated and made available so as to provide early information on rising trends of contamination and on levels that may be considered undesirable or may lead to unsafe human intakes.

Recommendation 79

It is recommended:

(a) That approximately 10 baseline stations be set up, with the consent of the States involved, in areas remote from all sources of pollution in order to monitor long-term global trends in atmospheric constituents and properties which may cause changes in meteorological properties, including climatic changes;

(b) That a much larger network of not less than 100 stations be set up, with the consent of the states involved, for monitoring properties and constituents of the atmosphere on a regional basis and especially changes in the distribution and concentration of contaminants;

(c) That these programmes be guided and co-ordinated by the World Meteorological Organization;

(d) That the World Meteorological Organization, in co-operation with the International Council of Scientific Unions (ICSU), continue to carry out the Global Atmospheric Research Programme(GARP), and if necessary establish new programmes to understand better the general circulation of the atmosphere and the causes of climatic changes whether these causes are natural or the result of man's activities.

Recommendation 80

It is recommended that the Secretary-General ensure:

(a) That research activities in terrestrial ecology be encouraged, supported and co-ordinated through the appropriate agencies, so as to provide adequate knowledge of the inputs, movements, residence times and ecological effects of pollutants identified as critical;

(b) That regional and global networks of existing and, where necessary, new research stations, research centres, and biological reserves be designated or established within the framework of the Man and Biosphere Programme (MAB) in all major ecological regions, to facilitate intensive analysis of the structure and functioning of ecosystems under natural or managed conditions;

(c) That the feasibility of using stations participating in this programme for surveillance of the effects of pollutants on ecosystems be investigated;

(d) That programmes such as the Man and the Biosphere Programme be used to the extent possible to monitor: (i) the accumulation of hazardous compounds in biological and abiotic material at representative sites; (ii) the effect of such accumulation on the reproductive success and population size of selected species.

Recommendation 81

It is recommended that the World Health Organization, together with the international organizations concerned, continue to study, and establish, primary standards for the protection of the human organism, especially from pollutants that are common to air, water and food, as a basis for the establishment of derived working limits.

Recommendation 82

It is recommended that increased support be given to the Codex Alimentarius Commission to develop international standards for pollutants in food and a code of ethics for international food trade, and that the capabilities of the Food and Agriculture Organization of the United Nations and the World Health Organization to assist materially and to guide developing countries in the field of food control be increased.

Recommendation 83

It is recommended that the appropriate United Nations agencies develop agreed procedures for setting derived working limits for common air and water contaminants.

Recommendation 84

It is recommended that Governments make available, through the International Referral System established in pursuance of recommendation 101 of this Conference, such information as may be requested on their pollution research and pollution control activities, including legislative and administrative arrangements, research on more efficient pollution control technology, and cost-benefit methodology.

Recommendation 85

It is recommended that any mechanism for co-ordinating and stimulating the actions of the different United Nations organs in connection with environmental problems include among its functions:

(a) Development of an internationally accepted procedure for the identification of pollutants of international significance and for the definition of the degree and scope of international concern;

(b) Consideration of the appointment of appropriate inter-governmental, expert bodies to assess quantitatively the exposures, risks, pathways and sources of pollutants of international significance;

(c) Review and co-ordination of international co-operation for pollution control, ensuring in particular that needed measures shall be taken and that measures taken in regard to various media and sources shall be consistent with one another;

(d) Examination of the needs for technical assistance to Governments in the study of pollution problems, in particular those involving international distribution of pollutants;

(e) Encouragement of the establishment of consultation mechanisms for speedy implementation of concerted abatement programmes with particular emphasis on regional activities.

B. MARINE POLLUTION

Recommendation 86

It is recommended that Governments, with the assistance and guidance of appropriate United Nations bodies, in particular the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP):

(a) Accept and implement available instruments on the control of the maritime sources of marine pollution;

(b) Ensure that the provisions of such instruments are complied with by ships flying their flags and by ships operating in areas under their jurisdiction and that adequate provisions are made for reviewing the effectiveness of, and revising, existing and proposed international measures for control of marine pollution;

(c) Ensure that ocean dumping by their nationals anywhere, or by any person in areas under their jurisdiction, is controlled and that Governments shall continue to work towards the completion of, and bringing into force as soon as possible of, an over-all instrument for the control of ocean dumping as well as needed regional agreements within the framework of this instrument, in particular for enclosed seas, which are more at risk from pollution;

(d) Refer the draft articles and annexes contained in the report of the intergovernmental meetings at Reykjavik, Iceland, in April 1972 and in London in May 1972 to the United Nations Committee on the Peaceful Uses of the Seabed and the Ocean Floor beyond the Limits of National Jurisdiction at its session in July/August 1972 for information and comments and to a conference of Governments to be convened by the Government of the United Kingdom of Great Britain and Northern Ireland in consultation with the Secretary-General of the United Nations before November 1972 for further consideration, with a view to opening the proposed convention for signature at a place to be decided by that Conference, preferably before the end of 1972;

(e) Participate fully in the 1973 Intergovernmental Maritime Consultative Organization (IMCO) Conference on Marine Pollution and the Conference on the Law of the Sea scheduled to begin in 1973, as well as in regional efforts, with a view to bringing all significant sources of pollution within the marine environment, including radioactive pollution from nuclear surface ships and submarines, and in particular to complete elimination of deliberate pollution by oil from ships, with the goal of achieving this by the middle of the present decade;

(f) Strengthen national controls over land-based sources of marine pollution, in particular in enclosed and semi-enclosed seas, and recognize that, in some circumstances, the discharge of residual heat from nuclear and other power-stations may constitute a potential hazard to marine ecosystems.

Recommendation 87

It is recommended that Governments:

(a) Support national research and monitoring efforts that contribute to agreed international programmes for research and monitoring in the marine environment, in particular the Global Investigation of Pollution in the Marine Environment (GIPME) and the Integrated Global Ocean Station System (IGOSS);

(b) Provide to the United Nations, the Food and Agriculture Organization of the United Nations and the United Nations Conference on Trade and Development, as appropriate to the data-gathering activities of each, statistics on the production and use of toxic or dangerous substances that are potential marine pollutants, especially if they are persistent;

(c) Expand their support to components of the United Nations system concerned with research and monitoring in the marine environment and adopt the measures required to improve the constitutional, financial and operational basis under which the Inter-governmental Oceanographic Commission is at present operating so as to make it an effective joint mechanism for the Governments and United Nations organizations concerned (United Nations Educational, Scientific and Cultural Organization, Food and Agriculture Organization of the United Nations, World Meteorological Organization, Inter-Governmental Maritime Consultative Organization, United Nations) and in order that it may be able to take on additional responsibilities for the promotion and co-ordination of scientific programmes and services.

Recommendation 88

It is recommended that the Secretary-General, together with the sponsoring agencies, make it possible for the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP):

(a) To re-examine annually, and revise as required, its "Review of Harmful Chemical Substances", with a view to elaborating further its assessment of sources, pathways and resulting risks of marine pollutants;

(b) To assemble, having regard to other work in progress, scientific data and to provide advice on scientific aspects of marine pollution, especially those of an interdisciplinary nature.

Recommendation 89

It is recommended that the Secretary-General ensure:

(a) That mechanisms for combining world statistics on mining, production, processing, transport and use of potential marine pollutants shall be developed along with methods for identifying high-priority marine pollutants based in part on such data;

(b) That the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP), in consultation with other expert groups, propose guidelines for test programmes to evaluate toxicity of potential marine pollutants;

(c) That the Food and Agriculture Organization of the United Nations, the World Health Organization, the Intergovernmental Oceanographic Commission and the International Atomic Energy Agency encourage studies of the effects of high-priority marine pollutants on man and other organisms, with appropriate emphasis on chronic, low-level exposures;

(d) That the Intergovernmental Oceanographic Commission, with the Food and Agriculture Organization of the United Nations and the World Health Organization, explore the possibility of establishing an international institute for tropical marine studies, which would undertake training as well as research.

Recommendation 90

It is recommended that the Intergovernmental Oceanographic Commission, jointly with the World Meteorological Organization and, as appropriate, in co-operation with other interested intergovernmental bodies, promote the monitoring of marine pollution, preferably within the framework of the Integrated Global Ocean Station System (IGOSS), as well as the development of methods for monitoring high-priority marine pollutants in the water, sediments and organisms, with advice from the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) on Intercomparability of methodologies.

Recommendation 91

It is recommended that the Intergovernmental Oceanographic Commission:

(a) Ensure that provision shall be made in international marine research, monitoring and related activities for the exchange, dissemination, and referral to sources of data and information on baselines and on marine pollution and that attention shall be paid to the special needs of developing countries;

(b) Give full consideration, with the Food and Agriculture Organization of the United Nations, the World Meteorological Organization, the Inter-Governmental Maritime Consultative Organization, the World Health Organization, the International Atomic Energy Agency, the International Hydrographic Organization and the International Council for the Exploration of the Sea and other interested and relevant organizations, to the strengthening of on-going marine and related data and information exchange and dissemination activities;

(c) Support and concept of development of an interdisciplinary are interorganizational system primarily involving centres already in existence;

(d) Initiate an interdisciplinary marine pollution data and scientific information referral capability.

Recommendation 92

It is recommended:

(a) That Governments collectively endorse the principles set forth in paragraph 197 of Conference documentA/CONF.48/8 as guiding concepts for the Conference on the Law of the Sea and the Inter-

Governmental Maritime Consultative Organization (IMCO) Marine Pollution Conference scheduled to be held in 1973 and also the statement of objectives agreed on at the second session of the Intergovernmental Working Group on Marine Pollution, which reads as follows:

> *'The marine environment and all the living organisms which it supports are of vital importance to humanity, and all people have an interest in assuring that this environment is so managed that its quality and resources are not impaired. This applies especially to coastal area resources. The capacity of the sea to assimilate wastes and render them harmless and its ability to regenerate natural resources are not unlimited. Proper management is required and measures to prevent and control marine pollution must be regarded as an essential element in this management of the oceans and seas and their natural resources.'',*

and that, in respect of the particular interest of coastal States in the marine environment and recognizing that the resolution of this question is a matter for consideration at the Conference on the Law of the Sea, they take note of the principles on the rights of coastal States discussed but neither endorsed nor rejected at the second session of the Intergovernmental Working Group on Marine Pollution and refer those principles to the 1973 Inter-Governmental Maritime Consultative Organization Conference for information and to the 1973 Conference on the Law of the Sea for such action as may be appropriate;

(b) That Governments take early action to adopt effective national measures for the control of all significant sources of marine pollution, including land-based sources, and concur and co-ordinate their actions regionally and where appropriate on a wider international basis;

(c) That the Secretary-General, in co-operation with appropriate international organizations, endeavour to provide guidelines which Governments might wish to take into account when developing such measures.

Recommendation 93

It is recommended that any mechanism for co-ordinating and stimulating the actions of the different United Nations organizations in connection with environmental problems include among its functions over-all responsibility for ensuring that needed advice on marine pollution problems shall be provided to Governments.

Recommendation 94

It is recommended that the Secretary-General, with the co-operation of United Nations bodies, take steps to secure additional financial support to those training and other programmes of assistance that contribute to increasing the capacity of developing countries to participate in international marine research, monitoring and pollution-control programmes.

EDUCATIONAL, INFORMATIONAL, SOCIAL AND CULTURAL ASPECTS OF ENVIRONMENTAL ISSUES

Recommendation 95

It is recommended that the Secretary-General make arrangements for the United Nations system:

(a) To provide countries on request with the necessary technical and financial assistance in preparing national reports on the environment, in setting up machinery for monitoring environmental developments from the social and cultural standpoint and, in particular, in drawing up national, social, educational and cultural programmes;

(b) To support and encourage projects for continuing co-operation among national, social, educational and cultural programmes, including their economic aspects, in an international network. The organizations of the United Nations system, including the regional economic commissions and the United Nations Economic Social Office in Beirut, will be called upon to participate in this activity, as will other international governmental and non- governmental agencies;

(c) To organize the exchange of information on experience, methods and work in progress in connection with continuous social diagnosis, particularly at the regional level and between regions with common problems;

(d) To facilitate the development of social and cultural indicators for the environment, in order to establish a common methodology for assessing environmental developments and preparing reports on the subject;

(e) To prepare, on the basis of the national reports on the state of, and outlook for, the environment, periodic reports on regional or subregional situations and on the international situation in this matter.

The activities described above could be co-ordinated by the new bodies for environmental co-ordination, taking into account the priorities agreed upon according to the resources available. International bodies responsible for technical and financial co-operation and assistance could also help in carrying out these tasks.

Recommendation 96

1. It is recommended that the Secretary-General, the organizations of the United Nations system, especially the United Nations Educational, Scientific and Cultural Organization, and the other international agencies concerned, should, after consultation and agreement, take the necessary steps to establish an international programme in environmental education, interdisciplinary in approach, in school and out of school, encompassing all levels of education and directed towards the general public, in particular the ordinary citizen living in rural and urban areas, youth and adult alike, with a view to educating him as to the simple steps he might take, within his means, to manage and control his environment. A programme of technical and financial co-operation and assistance will be needed to support this programme, taking into account the priorities agreed upon according to the resources available. This programme should include, among other things:

(a) The preparation of an inventory of existing systems of education which include environmental education;

(b) The exchange of information on such systems and, in particular, dissemination of the results of experiments in teaching;

(c) The training and retraining of professional workers in various disciplines at various levels (including teacher training);

(d) Consideration of the formation of groups of experts in environmental disciplines and activities, including those concerning the economic, sociological, tourist and other sectors, in order to facilitate the exchange of experience between countries which have similar environmental conditions and comparable levels of development;

(e) The development and testing of new materials and methods for all types and levels of environmental education.

2. It is further recommended that United Nations Educational, Scientific and Cultural Organization, under the Man and the Biosphere Programme, the World Health Organization, the Food and Agricultural Organization of the United Nations, the United Nations Industrial Development Organization, the World Meteorological Organization and all the organizations concerned, including the scientific unions co-ordinated by the International Council of Scientific Unions, should develop their activities in studying desirable innovations in the training of specialists and technicians and, in collaboration with the United Nations Development Programme, should encourage the institution, at the regional and the international level, of courses and training periods devoted to the environment.

3. It is further recommended that international organizations for voluntary service, and, in particular, the International Secretariat for Volunteer Service, should include environmental skills in the services they provide, in consultation with the United Nations Development Programme through the United Nations Volunteer Programme.

Recommendation 97

1. It is recommended that the Secretary-General make arrangements:

(a) To establish an information programme designed to create the awareness which individuals should have of environmental issues and to associate the public with environmental management and control. This programme will use traditional and contemporary mass media of communication, taking distinctive national conditions into account. In addition, the programme must provide means of stimulating active participation by the citizens, and of eliciting interest and contributions from non-governmental organizations for the preservation and development of the environment;

(b) To institute the observance of a World Environment Day;

(c) For the preparatory documents and official documents of the Conference to be translated into widest possible range of languages and circulated as widely as possible;

(d) To integrate relevant information on the environment in all its various aspects into the activities of the information organs of the United Nations system;

(e) To develop technical co-operation, particularly through and between the United Nations regional economic commissions and the United Nations Economic and Social Office in Beirut.

2. It is also recommended that the Secretary-General and the development agencies make arrangements to use and adapt certain international development programmes — provided that this can be done without delaying their execution — so as to improve the dissemination of information and to strengthen community action on environment problems, especially among the oppressed and underprivileged peoples of the earth.

Recommendation 98

It is recommended that Governments, with the assistance of the Secretary-General, the Food and Agricultural Organization of the United Nations, the United Nations Educational, Scientific and Cultural Organization and the other international and regional intergovernmental and non-governmental agencies concerned, should continue the preparation of the present and future conventions required for the conservation of the world's natural resources and cultural heritage. In the course of this preparatory work, Governments should consider the possibility of putting into operation systems of protection for elements of the world heritage, under which those Governments that wish to save elements of their national heritage of universal value would be able to obtain from the international community, on request, the technical and financial assistance required to bring their efforts to fruition.

Recommendation 99

1. It is recommended that Governments should:

(a) Noting that the draft convention prepared by United Nations Educational, Scientific and Cultural Organization concerning the protection of the world natural and cultural heritage marks a significant step towards the protection, on an international scale, of the environment, examine this draft convention with a view to its adoption at the next General Conference of UNESCO;

(b) Whenever appropriate, sign the Convention on Conservation of Wetlands of International Importance;

2. It is recommended that the Secretary-General, in consultation with the competent agencies of the United Nations system and the non-governmental organizations concerned, make arrangements for a detailed study of all possible procedures for protecting certain islands for science;

3. It is recommended that a plenipotentiary conference be convened as soon as possible, under appropriate governmental or intergovernmental auspices, to prepare and adopt a convention on export, import and transit of certain species of wild animals and plants.

Recommendation 100

It is recommended that the Secretary-General make arrangements:

(a) To be kept informed of national pilot schemes for new forms of environmental management;

(b) To assist countries, on request, with their research and experiments;

(c) To organize the international exchange of information collected on this subject.

Recommendation 101

It is recommended that the Secretary-General take the appropriate steps, including the convening of an expert meeting, to organize an International Referral Service for sources of environmental information, taking into account the model described in paragraphs 129 to 136 of the report on educational, informational, social and cultural aspects of environmental issues (A/CONF.48/9), in order to assist in the successful implementation of all the recommendations made in respect of those aspects of environmental issues and of most of the recommendations envisaged in the other substantive subject areas covered in the Conference agenda.

DEVELOPMENT AND ENVIRONMENT

Recommendation 102

It is recommended that the appropriate regional organizations give full consideration to the following steps:

(a) Preparing short-term and long-term plans at regional, subregional and sectoral levels for the study and identification of the major environmental problems faced by the countries of the region concerned as well as the special problems of the least developed countries of the region and of the countries with coastlines and inland lakes and rivers exposed to the risk of marine and other forms of pollution;

(b) Evaluating the administrative, technical and legal solutions to various environmental problems in terms of both preventive and remedial measures, taking into account possible alternative and/or multidisciplinary approaches to development;

(c) Preparation, within the framework of international agreements, of legislative measures designed to protect marine (and fresh-water) fisheries resources within the limits of their national jurisdiction;

(d) Increasing and facilitating, in the context of development and as proposed in the World Plan of Action for the Application of Science and Technology to Development, the acquisition and distribution of information and experience to member countries through global and regional co-operation, with par-

ticular emphasis on an international information referral networks approach and on a regular exchange of information and observation among the regional organizations;

(e) Establishing facilities for the exchange of information and experience between less industrialized countries which, although situated in different regions, share similar problems as a result of common physical, climatic and other factors;

(f) Encouraging the training of personnel in the techniques of incorporating environmental considerations into developmental planning, and of identifying and analysing the economic and social cost-benefit relationships of alternative approaches;

(g) Establishing criteria, concepts and a terminology of the human environment through interdisciplinary efforts;

(h) Establishing and disseminating information on the significant environmental problems of each region and the nature and result of steps taken to cope with them;

(i) Providing and co-ordinating technical assistance activities directed towards establishing systems of environmental research, information and analysis at the national level;

(j) Assisting developing countries, in co-operation with appropriate international agencies, in promoting elementary education, with emphasis on hygiene,and in developing and applying suitable methods for improving housing, health, sanitation and water supply, and controlling soil erosion.Emphasis should be placed on techniques promoting the use of local labour and utilizing local materials and local expertise in environmental management.

(k) Encouraging the appropriate agencies and bodies within the United Nations to assist the developing countries, at their request, in establishing national science, technology and research policies to enable the developing countries to acquire the capacity to identify and combat environmental problems in the early planning and development stages. In this respect, special priority should be accorded to the type of research, technology and science which would help developing countries to speed up, without adverse environment effects, the exploration, exploitation, processing and marketing of their natural resources.

Recommendation 103

It is recommended that Governments take the necessary steps to ensure:

(a) That all countries present at the Conference agree not to invoke environmental concerns as a pretext for discriminatory trade policies or for reduced access to markets and recognize further that the burdens of the environmental policies of the industrialized countries should not be transferred, either directly or indirectly, to the developing countries. As a general rule, no country should solve or disregard its environmental problems at the expense of other countries;

(b) That where environmental concerns lead to restrictions on trade, or to stricter environmental standards with negative effects on exports, particularly from developing countries, appropriate measures for compensation should be worked out within the framework of existing contractual and institutional arrangements and any new such arrangements that can be worked out in the future;

(c) That the General Agreement of Tariffs and Trade, among other international organizations, could be used for the examination of the problems, specifically through the recently established Group on Environmental Measures and International Trade and through its general procedures for bilateral and multilateral adjustment of differences;

(d) That whenever possible (that is, in cases which do not require immediate discontinuation of imports), countries should inform their trading partners in advance about the intended action in order that there might be an opportunity to consult within the GATT Group on Environmental Measures and International Trade, among other international organizations. Assistance in meeting the consequences of stricter environmental standards ought to be given in the form of financial or technical assistance for research with a view to removing the obstacles that the products of developing countries have encountered;

(e) That all countries agree that uniform environmental standards should not be expected to be applied universally by all countries with respect to given industrial processes or products except in those cases where environmental disruption may constitute a concern to other countries. In addition, in order to avoid an impairment of the access of the developing countries to the markets of the industrialized countries because of differential product standards, Governments should aim at world-wide harmonization of such standards. Environmental standards should be established, at whatever levels are necessary, to safeguard the environment, and should not be directed towards gaining trade advantages;

(f) That the Governments and the competent international organizations keep a close watch on medium and long-term trends in international trade and take measures with a view to promoting:

(i) The exchange of environmental protection technologies;

(ii) International trade in natural products and commodities which compete with synthetic products that have a greater capacity for pollution.

Recommendation 104

It is recommended that the Secretary-General ensure:

(a) That appropriate steps shall be taken by the existing United Nations organizations to identify the major threats to exports, particularly those of developing countries, that arise from environmental concerns, their character and severity, and the remedial action that may be envisaged;

(b) That the United Nations system, in co-operation with other governmental and non-governmental agencies working in this field, should assist Governments to develop mutually acceptable common international environmental standards on products which are considered by Governments to be of significance in foreign trade. Testing and certification procedures designed to ensure that the products conform to these standards should be such as to avoid arbitrary and discriminatory actions that might affect the trade of developing countries.

Recommendation 105

It is recommended that the General Agreement of Tariffs and Trade, the United Nations Conference on Trade and Development and other international bodies, as appropriate, should, within their respective fields of competence, consider undertaking to monitor, assess and regularly report the emergence of tariff and non-tariff barriers to trade as a result of environmental policies.

Recommendation 106

It is recommended:

(a) That the Secretary-General, in co-operation with other international bodies as appropriate, should examine the extent to which the problems of pollution could be ameliorated by a reduction in the current levels of production and in the future rate of growth of the production of synthetic products and substitutes which, in their natural form, could be produced by developing countries; and make recommendations for national and international action;

(b) That Governments of the developing countries consider fully the new opportunities that may be offered to them to establish industries and/or expand existing industries in which they may have comparative advantages because of environmental considerations, and that special care be taken to apply the appropriate international standards on environment in order to avoid the creation of pollution problems in developing countries;

(c) That the Secretary-General, in consultation with appropriate international agencies, undertake a full review of the practical implications of environmental concerns in relation to distribution of future industrial capacity and, in particular, to ways in which the developing countries may be assisted to take advantage of opportunities and to minimize risks in this area.

Recommendation 107

It is recommended that the Secretary-General, in collaboration with appropriate international agencies, ensure that a study be conducted of appropriate mechanisms for financing international environmental action, taking into account General Assembly resolution 2849 (XXVI).

Recommendation 108

It being recognized that it is in the interest of mankind that the technologies for protecting and improving the environment be employed universally, it is recommended that the Secretary-General be asked to undertake studies, in consultation with Governments and appropriate international agencies, to find means by which environmental technologies may be made available for adoption by developing countries under terms and conditions that encourage their wide distribution without constituting an unacceptable burden to developing countries.

Recommendation 109

It is recommended that the Secretary-General, in collaboration with appropriate international agencies, take steps to ensure that environmental considerations of an international nature related to the foregoing recommendations be integrated into the review and appraisal of the International Development Strategy for the Second Development Decade in such a way that the flow of international aid to developing countries is not hampered. Recommendations for national action, proposed by the Secretary-General of the Conference, shall be referred to Governments for their consideration and, when deemed appropriate, should be taken into account in the review and appraisal process during the consideration of matters for national action as included in the International Development Strategy. It should further be ensured that the preoccupation of developed countries with their own environmental problems should not affect the flow of assistance to developing countries, and that this flow should be adequate to meet the additional environmental requirements of such countries.

Appendix III

OTHER RESOLUTIONS ADOPTED AT THE STOCKHOLM CONFERENCE

OTHER RESOLUTIONS ADOPTED AT THE STOCKHOLM CONFERENCE

WORLD ENVIRONMENT DAY

Recognizing that all States participating in the Conference have determined to work together for the preservation and enhancement of the human environment,

Further recognizing that the Governments and peoples of the world have the responsibility to safeguard the human environment for future generations,

Convinced that the Conference should serve to recall the renewal of the determination of the Governments and peoples of the World to recognize their responsibility for the human environment and to undertake continuing efforts to preserve and enhance it,

Taking note of recommendation 97 adopted by the Conference,

Recommends that the General Assembly of the United Nations designate 5 June as 'World Environment Day'' and decide that on that day every year the United Nations system and the Governments of the world undertake world-wide activities reaffirming their concern for the preservation and enhancement of the human environment, with a view to deepening environmental awareness and to pursuing the determination expressed at the Conference.

NUCLEAR WEAPONS TESTS

Considering that there is radioactive contamination of the environment from nuclear weapons tests,

Taking into account the reports of the United Nations Scientific Committee on the Effects of Atomic Radiation,

Believing that all exposures of mankind to radiation should be kept to the minimum possible and should be justified by benefits that would otherwise not be obtained,

Considering that the United Nations has endorsed world treaties such as the Partial Test Ban Treaty and the Sea-Bed Denuclearization Treaty and regional treaties such as the Tlatelolco Treaty for the Denuclearization of Latin America, and has repeatedly called for the cessation of nuclear weapons tests,

Resolves:

(a) To condemn nuclear weapons tests, especially those carried out in the atmosphere;

(b) To call upon those states intending to carry out nuclear weapons tests to abandon their plans to carry out such tests since they may lead to further contamination of the environment.

CONVENING OF A SECOND UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT

Noting with satisfaction the truly global nature of the preparatory process for the first United Nations Conference on the Human Environment held at Stockholm from 5 to 16 June 1972,

Noting further that the preparatory process comprised world-wide activities that initiated interest in the assessment of environmental problems at the national and regional levels,

Realizing the need for maintaining these world-wide activities with a view to discovering further areas of common interest, and means of international co-operation, in environmental studies,

Convinced that the first United Nations Conference on the Human Environment held at Stockholm and the activities associated with it provided an excellent platform for intensive international consultations and the exchange of views regarding steps to be taken for establishing a balance between the maintenance of environmental quality and the needs of present and future generations,

1. Recommends that the General Assembly of the United Nations decide to convene a second United Nations Conference on the Human Environment;

2. Recommends further that the new environmental machinery referred to in the recommendations of the first United Nations Conference on the Human Environment be entrusted with the preparation for the second United Nations Conference on the Human Environment.

REFERRAL TO GOVERNMENTS OF RECOMMENDATIONS FOR ACTION AT THE NATIONAL LEVEL

The Conference at its 20th plenary meeting, held on 16 June 1972, formally adopted the provisional decision it had taken at its 1st plenary meeting on 6 June 1972 that it should directly commend the recommendations for action at the national level contained in the Conference documents to the attention of Governments for their consideration and for such action as they might deem appropriate.

Appendix IV

MEMBERS OF THE ONTARIO TASK FORCE ON THE HUMAN ENVIRONMENT

MEMBERS OF THE ONTARIO TASK FORCE

Canadian Action Plan
U.N. Stockholm Conference

Chairman

Mr. W. A. Steggles
Ministry of the Environment

Secretariat

Mr. M. J. Cathcart
Ministry of the Environment

Mr. H. Banning
Ministry of Treasury, Economics & Intergovernmental Affairs

Mr. R. G. Barrens,
Provincial Secretariat for Resources Development

Mr. J. B. Brubaker,
Ministry of Agriculture and Food

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Ontario Energy Board

Mr. T. W. Cross,
Ministry of the Environment

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Ontario Housing Corporation

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Ministry of Education

Mr. Q. F. Hess,
Ministry of Natural Resources

Mr. J. R. Kinley,
Ministry of Labour

Mr. P. Little,
Ministry of Energy

Mr. D. R. Martyn,
Ministry of Community & Social Services

Dr. E. Mastromatteo,
Ministry of Health

Mr. K. McCrea,
Ministry of Consumer & Commercial Relations

Mr. W. M. Maitland,
Ministry of Colleges & Universities

Mr. G. A. Pearce,
Ministry of the Environment

Mr. T. Reynolds,
The Hydro-Electric Power Commission of Ontario

Mr. I. V. Oliver,
Ministry of Transportation & Communications

Mr. W. J. Schabereiter,
Ministry of Industry & Tourism

Mr. G. R. Trewin,
Ministry of the Environment

Mr. E. W. Turner,
Ministry of the Environment

Mr. J. W. Wouters,
Ministry of Treasury, Economics & Intergovernmental Affairs

Mr. D. Young,
Ministry of the Environment

Edited by Mr. W. J. Patterson

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